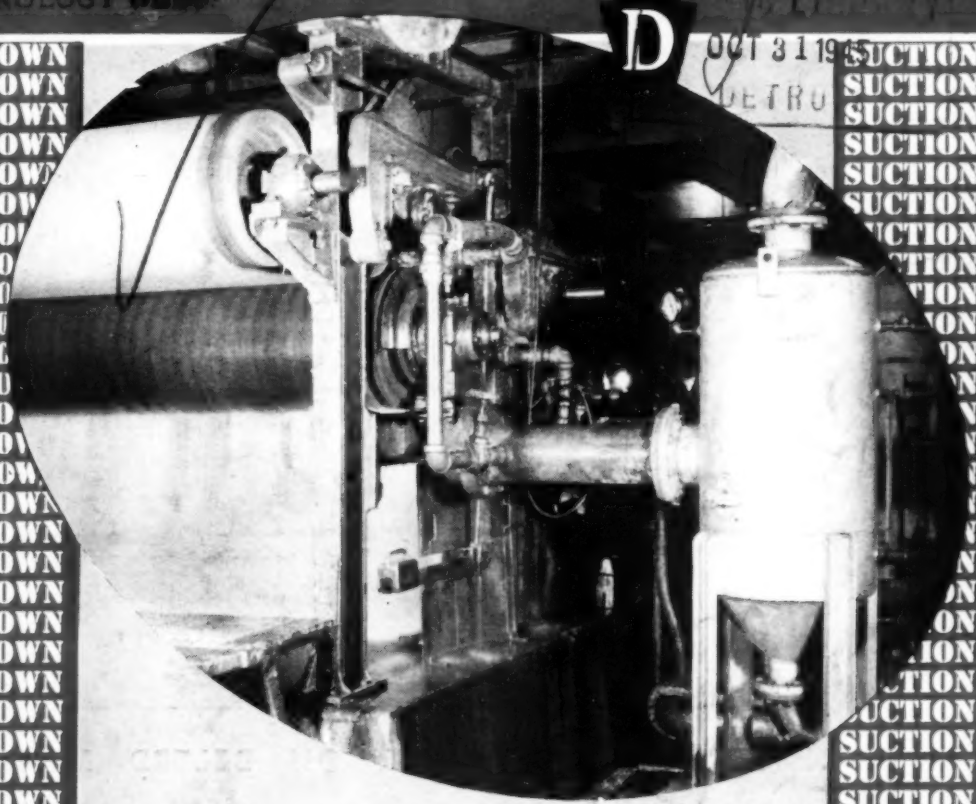
THE PAPER INDUSTRY and PAPER WORLD

AN EDUCATIONAL NEWS MAGAZINE—SEPTEMBER, 1945



Downingtown Suction Extractors have now become a fundamental part of a modern board machine, just like plain extractors and suction presses. Photo shows back side of an installation with separator or water leg, which prevents water removed from passing through the pump. Better get our catalog for your post-war planning.

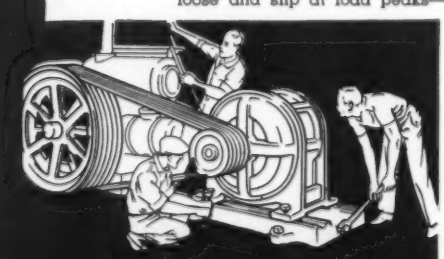
DOWNINGTOWN MFG. CO., DOWNINGTOWN, PA.

"All belt drives need belt tension control"

ROCKWOOD *automatic belt tightening* MOTOR BASES

BELT TENSION CONTROL ESSENTIAL ON BELTED MACHINES

For belt driven machines—either V-belt or flat belt driven—**if you want top performance and lowest costs** YOU HAVE TO HAVE BELT TENSION CONTROL. Otherwise as the belts stretch (and they all do—sooner or later—) they become too loose and slip at load peaks—which wears them out. Then the machine speed falls off—its capacity is reduced.



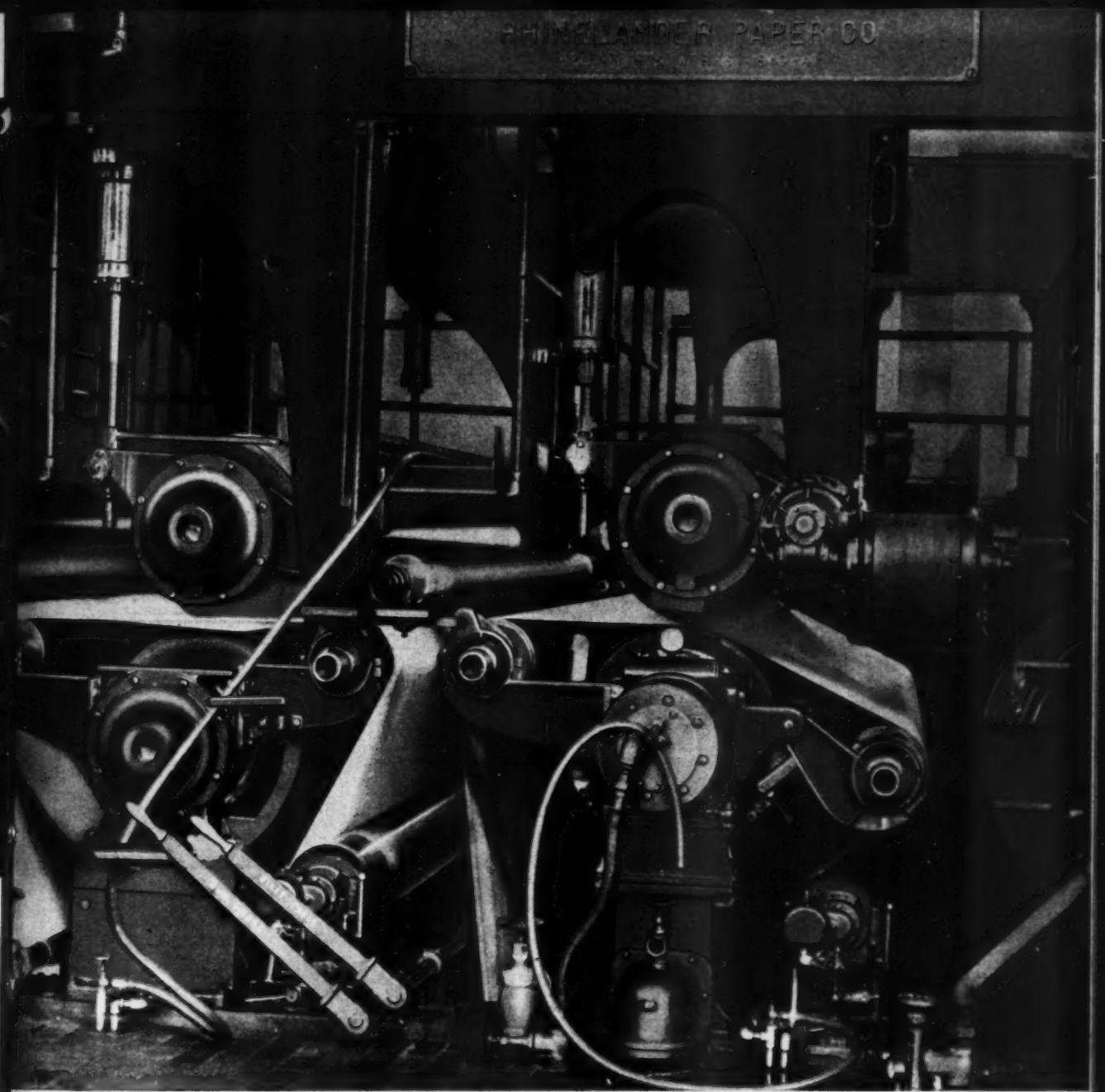
With Rockwood automatic tension control base under the motor **the belt tension automatically matches the load through all its changes**—the belt is never too loose—always just the right tension to prevent slip. **This keeps the driven machines running at maximum speed, increases machine capacity, decreases drive maintenance and practically doubles the life of the belts.** Also power is put to effective use—**machine performance is improved and more dependable.**

Belt tension control was originated and pioneered by Rockwood in their Rockwood pivoted motor bases. They are used in all industries and are essential for belt driven machines. Available from stock for most motors to 60-75 h.p.—from semi-stock to 250 h.p.; and larger sizes made to order. Needed for either flat or multiple V-belt drives.

ROCKWOOD

INDIANAPOLIS • U.S.A.

Specialists in Power Transmission Equipment Since 1884



Based on 87 years of experience . . .

The list of accomplishments of this Beloit patented Close Center Press is impressive. For one thing, it permits short draws, with the obvious attendant advantages in press operation. The arrangement also makes possible quicker felt changes. As a space-saver in connection with the rebuilding of existing machines, the press offers interesting possibilities; on certain grades, an ideal installation in a new machine.

BELOIT

PAPER MACHINERY

BELOIT IRON WORKS · PAPER MACHINERY · BELOIT, WIS., U.S.A.

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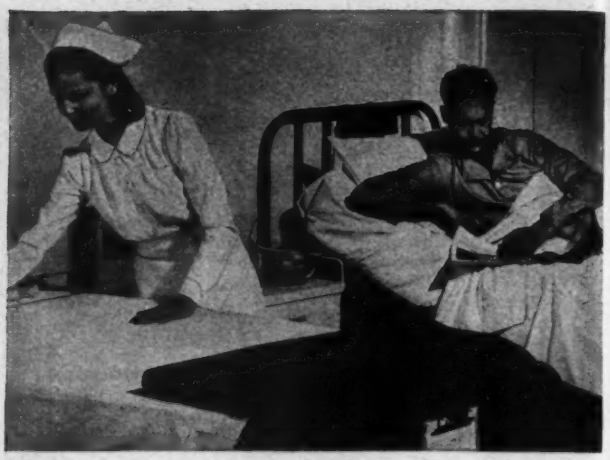
Sturdy furniture made of paper will make more jobs.



Soft paper sheets for hospitals will take workers to produce.

Whole meals frozen and shipped in paper. More jobs here.

Long-lasting rugs, woven on paper. Still more jobs!

Postwar Jobs—Wrapped Up in Paper!

WITH VICTORY, servicemen and war workers alike are going to need jobs. How many there will be, no one can say. But this much is known:

Business management is already laying plans to meet as quickly as possible the demand for goods that will exist when the war ends—and doing this will make jobs by the thousands.

Take the paper industry. Not only will paperboard, for packing and shipping postwar products, be needed by the thousands of tons, but new uses for paper—grown out of war discoveries—will increase that demand many times.

Imagine plasticized paper, for example, so tough that roofing tiles can be made of it. Imagine it so sturdy that it can be built into light-weight furniture. Imagine paper so soft, yet so resistant to tearing, that sheets and pillowcases for hospital use can be made of it.

These, and many other exciting new uses, will increase the demand for paper—and demand for goods makes jobs.

The paper industry is only one of many along the Chesapeake and Ohio, the Nickel Plate, and the Pere Marquette, that are planning now for postwar employment.

After the war, there will be lots of opportunities. So, if you are on a war job, stay on it until Uncle Sam says it's finished. Victory must come first.

If you have a war job, stay on it—there'll be lots of opportunities after Victory!

A Report on the Prospects for Postwar Employment In The Industries Served by

Chesapeake & Ohio Lines

Cleveland

CHESAPEAKE AND OHIO RAILWAY
NICKEL PLATE ROAD
PERE MARQUETTE RAILWAY

FOR YOUR TOUGHEST MATERIALS HANDLING JOBS . . . SPECIFY THE NEW
PHILCO "THIRTY"
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The tougher the jobs, the better this new Philco "Thirty" Storage Battery shows up. For long ramps and heavy loads — Philco "Thirty" delivers the power. And — in addition — it gives 30% longer life! Write today for the new Philco "Thirty" catalog.
The new Philco "Thirty" for electric industrial trucks is identified by its distinctive red connectors.
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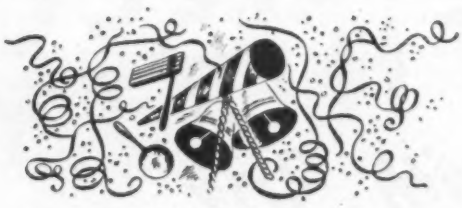
it's Post War now

For Mathieson's Sodium Chlorite and its Co-Product, Chlorine Dioxide



YES — through the ingenuity of Mathieson's chemical engineers, the available supply of Sodium Chlorite (and its amazingly useful co-product, Chlorine Dioxide) has been stepped-up to totals almost as great as originally planned for post war!

In simplest terms, this means that this most versatile — *under certain conditions most powerful and under other specific conditions most gentle* — oxidizing agent yet developed is available *now*. To many phases of American industry and to hundreds of communities beset with taste and odor problems in their water supply systems — this announcement will be of outstanding significance.

The adoption of Sodium Chlorite and Chlorine Dioxide in the technique of bleaching is certain to result in improved quality of many products now bleached by older methods. Textiles — cotton, rayon, and nylon . . . paper products of all kinds . . . edible and inedible oils . . . shellacs and varnishes . . . even beeswax and straw products, can be bleached *whiter* than ever before with an absolute minimum change of chemical and physical characteristics through the use of Sodium Chlorite. And Mathieson's research staff is still developing more and more uses for this greatest of oxidizing agents!

Mathieson is prepared to furnish full information on Sodium Chlorite — and Mathieson's staff is ready to work with you now in adapting this outstanding chemical to your requirements. Write today!

THE MATHIESON ALKALI WORKS (INC.) • 60 East 42nd Street, New York 17, N.Y.

SODIUM CHLORITE . . . CHLORINE DIOXIDE . . . HTH PRODUCTS . . . LIQUID CHLORINE . . . SODIUM METHYLATE . . . CAUSTIC SODA . . . SODA ASH . . . BICARBONATE OF SODA . . . FUSED ALKALI PRODUCTS . . . AMMONIA, ANHYDROUS & AQUA . . . SYNTHETIC SALT CAKE . . . DRY ICE . . . CARBONIC GAS

Mathieson
CHEMICALS

THE PAPER INDUSTRY and PAPER WORLD

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59 E. Van Buren St., Chicago 5, Ill.

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THE PAPER INDUSTRY and PAPER WORLD is indexed regularly in "The Industrial Arts Index." An index to each volume is issued annually by the publisher as Section Two of the April number.

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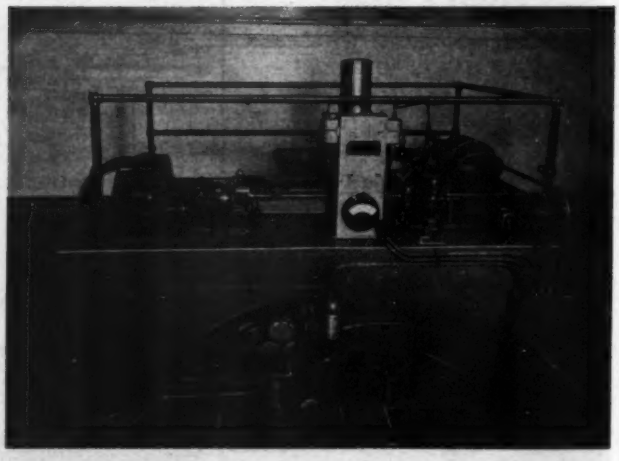
Entered as second class matter June 29, 1938, at the post office at Chicago, Ill., under the Act of March 3, 1879. Subscriptions in the United States, U. S. Possessions, Canada, Cuba and Mexico, $2.00 for one year, $3.00 for two years. All other countries $3.00 for one year, $5.00 for two years.

GREATER OPERATING EFFICIENCY
HIGHER PRODUCTION STANDARDS
and LOWER MANUFACTURING COSTS

for Groundwood Mills

with Continuous, High-Speed Grinding

Roberts Grinders are in production again. Now you can have a modern grinder room like this. Few mill changes need to be made in replacing the pocket type with these new grinders. During the war years a thorough study of the performance of the Roberts Grinder was carried on. The soundness of the operating principle has been definitely established. It has been shown that continuous, high-speed grinding is a much faster and a more profitable way to manufacture groundwood pulp. Better grades of stock are produced at any freeness and uniform consistency is maintained. Working conditions are improved, there is no escaping steam or vapor, no stock leakage, cleaner and safer operation. Many engineering refinements are being incorporated in the post-war Roberts Grinder that give it even greater efficiency and ease of maintenance and a stream-lined appearance. Write today for construction and operating details.



ROBERTS GRINDER

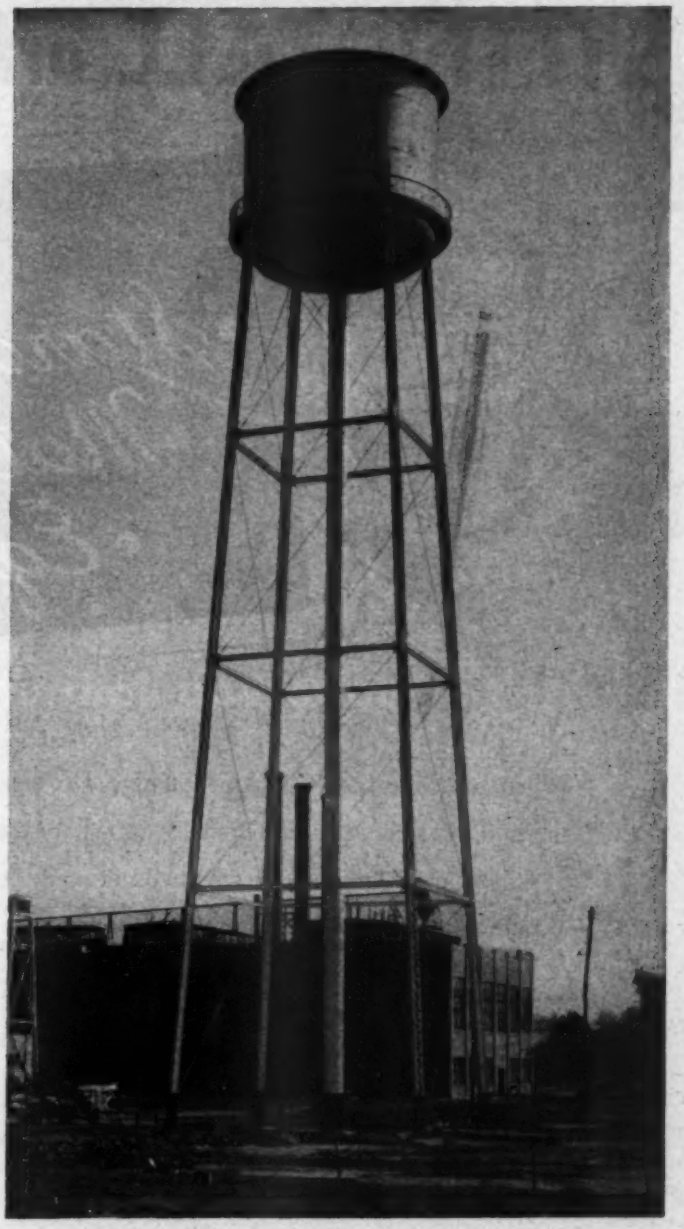
THE APPLETON MACHINE COMPANY
APPLETON • WISCONSIN
Eastern Sales Representatives, CASTLE & OVERTON, Inc., 630 Fifth Avenue, New York

FOR MILL FIRE PROTECTION . . . .

INSTALL an AUTOMATIC SPRINKLER SYSTEM and GRAVITY WATER PRESSURE

"The approximate cost of installing an automatic sprinkler system in a manufacturing plant ranges from 10 to 20 cents per sq. ft.," states an engineering firm specializing in this type of service. This is a small price to pay when the devastating effects of fire are considered. Loss of production, loss of profits and loss of customers to your competitors . . . while you attempt to rebuild . . . are just a few of the misfortunes that follow a fire. Automatic sprinkler service and a *ready supply of water* not only help provide "insurance" against fire damage but oftentimes result in substantial reductions in insurance premium rates. A recent installation of automatic sprinkler service and Horton elevated storage to supply a gravity source of water enabled one mill to reduce yearly fire insurance premiums 70%!

At right may be seen a 125,000-gal. Horton elevated storage tank installed at a southern mill to provide a ready supply of gravity water pressure to operate an automatic fire protection system. Horton elevated storage tanks are built to meet the requirements of insurance rating groups and engineering departments of insurance companies. While automatic sprinkler service usually requires elevated storage tanks with capacities of 50,000 to 250,000-gal., we also build elevated storage tanks ranging with capacities of from 5,000 to 2,000,000-gal. for general and municipal service.



A 125,000-gal. Horton elevated tank, 125 ft. to bottom, for sprinkler service at a paper mill. Elevated tank installations are sometimes piped for dual service so as to provide both general water service and fire protection.

If you plan to install an automatic fire protection system, or if your present system is dependent upon means other than gravity water pressure, be sure to investigate Horton elevated water storage tanks. Write to any of the offices shown below for quotations on standard capacity elevated tanks. Please state capacity, height-to-bottom and proposed erection site.

CHICAGO BRIDGE & IRON COMPANY

Chicago, 4.....2445 McCormick Building
New York, 6.....3350-165 Broadway Building
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Los Angeles, 14.....1459 Wm. Fox Building
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Plants at BIRMINGHAM, CHICAGO and GREENVILLE, PENNA.

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STEIN-HALL *offers counsel...*

What are your peacetime problems? Do you need counsel on the best starch method for your starch kitchen . . . on what type starch to use at a particular time or for a particular purpose? Are you studying material and equipment problems? Whatever your problem, Stein-Hall paper men can help you find the answer.

Our paper technical field men know their stuff. They are plant-wise, thoroughly familiar with materials, equipment and production methods. They can tell you the type of starch best suited to your needs, and how to plan an economical, efficient, flexible set-up for maximum results.

Our superior starches, gums and dextrines for sizing, calendering, coating and adhesive uses can be major factors in solving your problems. Call on us for counsel which will help you to secure your share of peacetime business.

79 YEARS OF STARCH SERVICE

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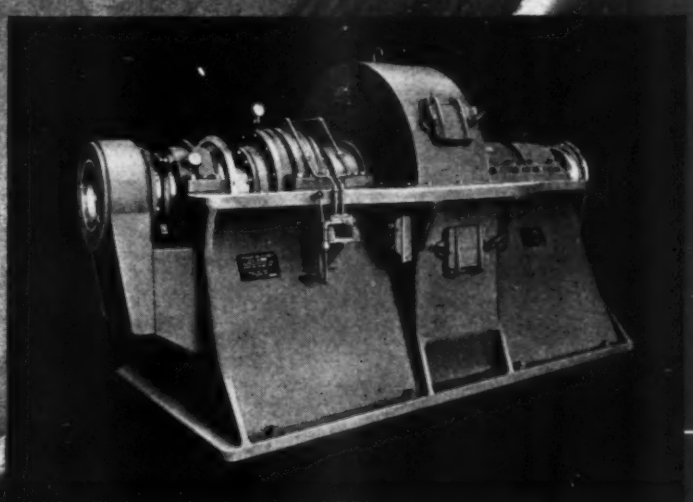
We conservatively estimate

that, in normal operation

Sutherland Refining Discs

will last at least 20 years.



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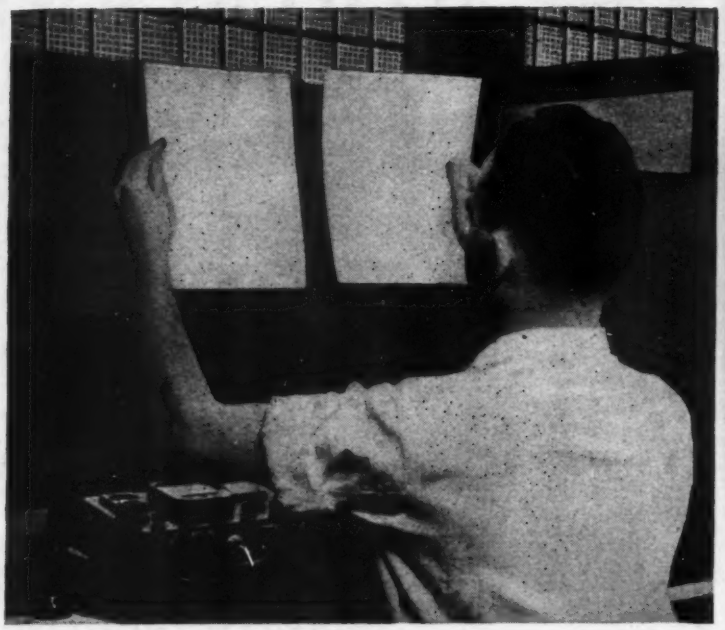
SPECIFY "GENERAL CHEMICAL"

...improve formation—appearance—quality

Visual as well as laboratory testing of paper formation establishes the necessity for using a pure, uniform "Alum" in manufacturing a high-grade sheet.

General Chemical Aluminum Sulfate—as well as the Company's other paper-making chemicals—is made with strict attention to every production detail. Constant laboratory control assures product uniformity and purity. For "Alum" you can rely upon, specify **General Chemical:**



aluminum sulfate

Standard—Lump; Ground, 99% thru 8 mesh, 95% thru 10 mesh; Powdered, 95% thru 100 mesh.

Iron Free—Lump, approx. 2½"; Ground, thru 8 mesh.

sodium silicate

Solutions: From 38°—60° Baume — Wt. Ratio (Na_2O to SiO_2) from 1:2.00—1:3.40

Appearance: Opalescent to clear.

GENERAL CHEMICAL COMPANY products for the paper industry

Aluminum Sulfate (Standard and Iron Free) • Copper Sulfate • Muriatic Acid (Hydrochloric) • Sodium Fluoride • Sodium Silicate • Sodium Metasilicate • Glauber's Salt (Crystal or Anhydrous) • Salt Cake Sodium Sulfide • Sodium Hyposulfite • Sodium Sulfite (Anhydrous) Sodium Bisulfite (Solution or Anhydrous) • Disodium Phosphate Trisodium Phosphate • Tetrasodium Pyrophosphate • Sulfuric Acid Nitre Cake (Sodium Bisulfate) • Nitric Acid

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Highly Engineered for Peak Performance

UNIFORM FIBRE TREATMENT

SHORT BEATING CYCLE

AUTOMATIC CONTROL

LOW H. P. PER TON

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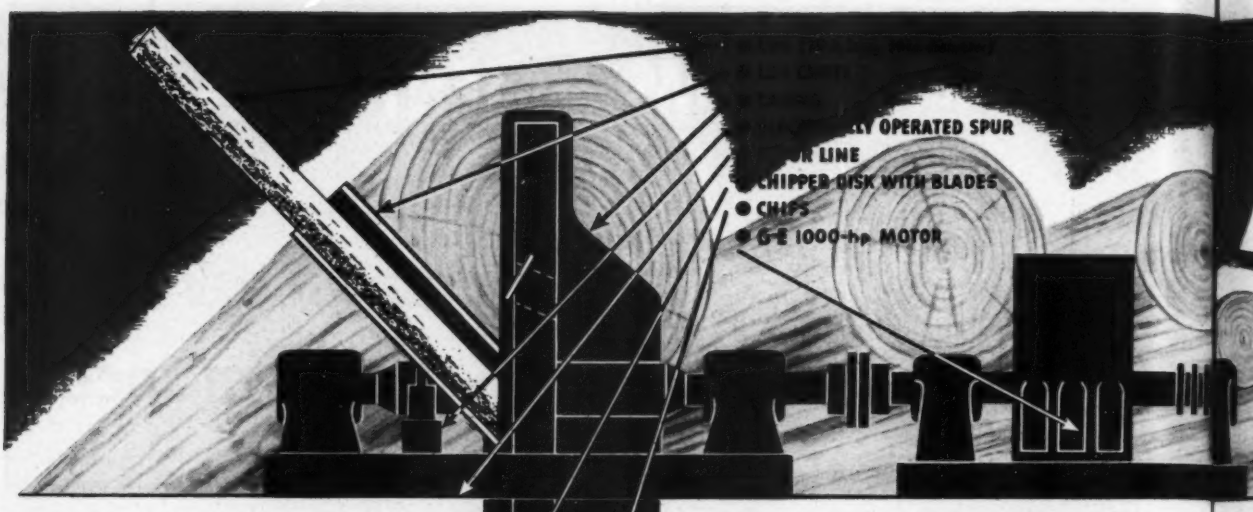
E.D. JONES & SONS COMPANY-PITTSFIELD, MASS.

Builders of Quality Machinery for Paper Mills



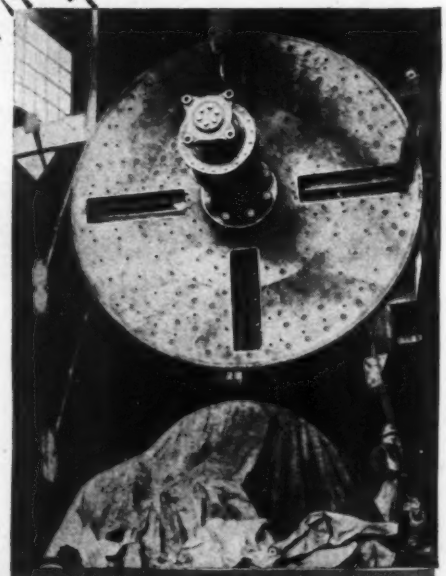
20-ft LOGS to CHIPS

This chipper, which is being driven by a 1000-hp wound-rotor motor at 240 rpm, "eats" logs up to 40 inches in diameter at a maximum rate of one foot a second. It indicates the wide range of motor-drive installations that General Electric has engineered to the special needs of the paper industry.

Four 48-in. knives are carried on the big 14-ft disk of the chipper, which is 10 inches thick. The disk's flywheel effect helps reduce power peaks—but there's still a sudden shock and shudder as logs up to 40 inches across come in against the spinning blades. The motor must withstand shock and sudden load changes. In an 8-hour shift, chips for 275 tons of sulphite pulp are produced.

The control system (Fig. 1) helps the wound-rotor motor to meet the peak loads which come with logs of large diameter. It provides smooth starting and "plugging" for prompt stops.

The wound-rotor induction motor has the advantage of limiting any sudden power increase to 500 kw (Fig. 2). Under other circumstances, the choice might go to a synchronous motor, which has somewhat higher efficiency and affords power-factor correction. Decisions like this are typical of those which G-E application engineers are prepared to help you make, based on an understanding of paper-mill technology along with electrical engineering.
General Electric Company, Schenectady 5, N. Y.



Chipper disk shown before installation. The wheel is 168 inches across and 10 inches thick.

BUY ALL THE BONDS YOU CAN— and keep all you buy

G-E 1000-hp MOTOR DRIVE ENGINEERED TO MEET SEVERE SHOCKS AND STRESSES OF POWERFUL CHIPPER

G-E 1000-hp (240 rpm) wound-rotor motor as applied to pulp-mill log chipper of a west coast company.

. . . IN 20 SECONDS!

HOW G-E MOTOR CONTROL HELPS CHIPPER TO HANDLE LOGS 40 INCHES IN DIAMETER

Motor starting is accomplished by closing contactors C, B, and A (in that order), shown in diagram at right. During normal runs, contactor A remains closed, leaving 6 per cent fixed resistance in the circuit. Under this arrangement, logs up to 30 inches in diameter are handled.

If a long 40-in. log comes into the chipper, the disk and motor will decelerate under the overload until the motor is taking about 180 per cent normal power. Then a notch-back relay opens contactor A, and disk-and-motor speed is further reduced by means of 12 per cent resistors until the maximum load peak (some 1300 kw) is again reached. At this point, a relay operates to stop the feed rolls, holding the logs back from the blades until the disk is brought back up to normal speed.

The chart below shows a typical operating cycle for a log 36 inches in diameter and about 16 feet long.

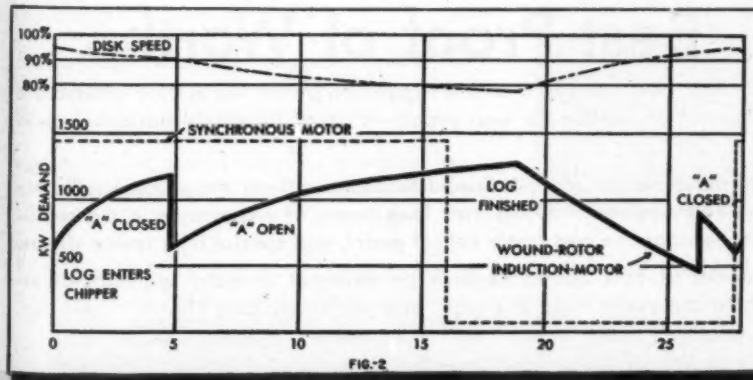


FIG. 2

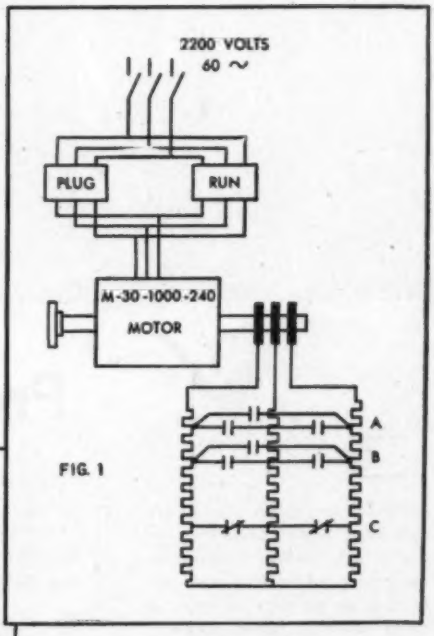
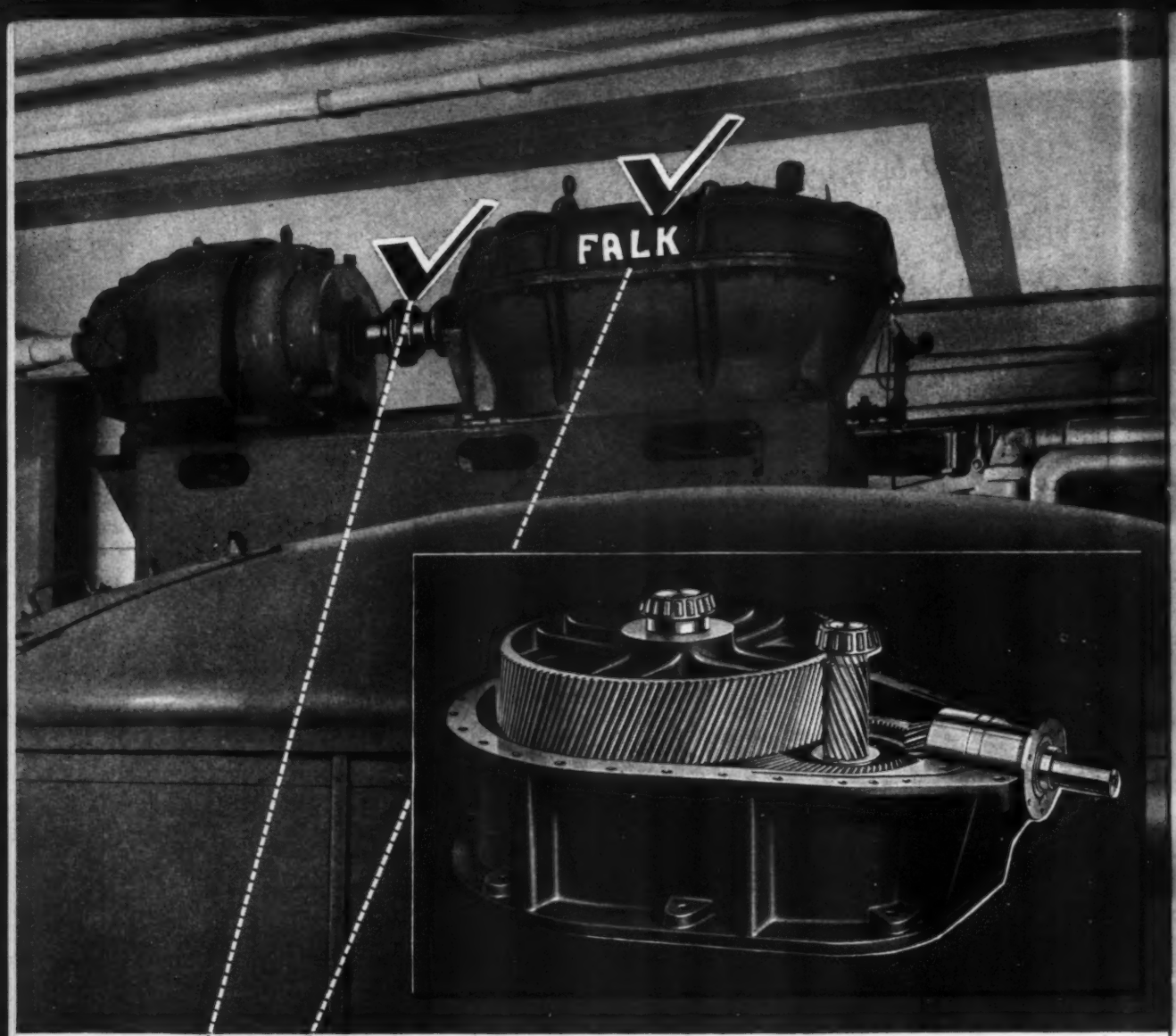


FIG. 1

GENERAL ELECTRIC

PAPER-MILL DRIVES



This illustration shows a Falk Vertical Right Angle Speed Reducer and a Falk Steelflex Coupling as the power transmitting units operating an agitator drive in a large nationally known brewery. This combination of a Falk Steelflex Coupling and a Falk Speed Reducer is typical of many such installations throughout every industrial field.

Proof by Performance is the Best Proof of Worth

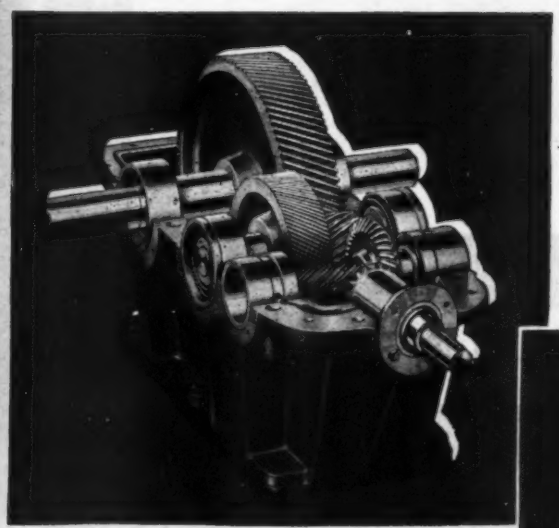
Words at their best can carry only a suggestion of the worth of a product... The final proof of worth—the best proof—is proof by actual performance in the field.

The field performance of Falk Speed Reducers reflects the unusual skills acquired by Falk engineers during their long years of experience in the manufacture of herringbone and single helical gears, and special high speed drives.

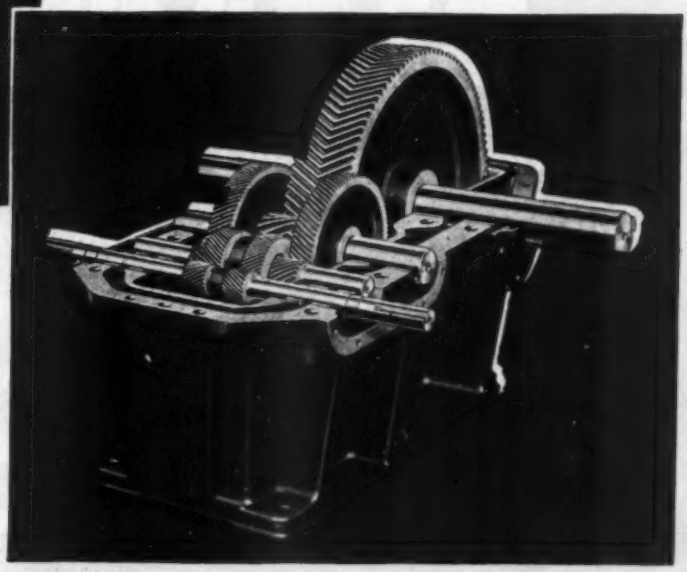
Case histories of Falk Speed Reducer performance in many segments of industry show continuous high efficiency, and extremely long life.

IT ALWAYS PAYS TO CONSULT FALK

Any Size... Any Service Requirement can be fully met with Falk Speed Reducers



Falk Speed Reducers are available in single, double, and triple reduction; in parallel shaft, horizontal right angle and vertical right angle types; in ranges from 0.13 H.P. to 2000 H.P.; in ratios from 1.5:1 to 5.28:1 to 52:1 to 515:1 . . . Available with either sleeve or roller bearings . . . All Falk Speed Reducers have a 100% excess capacity and peak efficiencies from 96% to 98½% depending upon the reduction . . . Symmetrical arrangement assures balanced performance . . . Patented system of lubrication and interchangeability of parts assure long life.



Left: Right angle Falk Speed Reducer with vertical low speed shaft. Available in single reduction units, 1.5:1 to 5.28:1; double reduction, 5.7:1 to 43.5:1; triple reduction, 52.1:1 to 430:1.

Above: Right angle speed reducer. Available in single reduction units, 1.15:1 to 5.28:1; double reduction, 5.7:1 to 52.1:1; triple reduction, 56:1 to 515:1.

Right: Parallel shaft, herringbone speed reducer. Ratios: single reduction, 1.5:1 to 10:1; double reduction, 11.5:1 to 70.2:1; triple reduction, 80:1 to 300:1.

THE FALK CORPORATION, MILWAUKEE 8 WISCONSIN

For over fifty years precision manufacturers of Speed Reducers . . . Motoreducers . . . Flexible Couplings . . . Herringbone and Single Helical Gears . . . Heavy Gear Drives . . . Marine Turbine and Diesel Gear Drives and Clutches . . . Contract Welding and Machine Work • District Offices, Representatives, or Distributors in principal cities.

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BLEACHING

AMERICAN INDUSTRY'S CORRESPONDENCE PAPER AND BUSINESS FORMS TO MAXIMUM WHITENESS IS JUST ONE OF THE IMPORTANT PROCESSING OPERATIONS IN WHICH DIAMOND LIQUID CHLORINE HAS BEEN SO SUCCESSFULLY USED OVER THE YEARS. AVAILABLE IN SINGLE UNIT OR MULTI-UNIT TANK CARS AS YOUR REQUIREMENTS DEMAND.

DIAMOND ALKALI COMPANY
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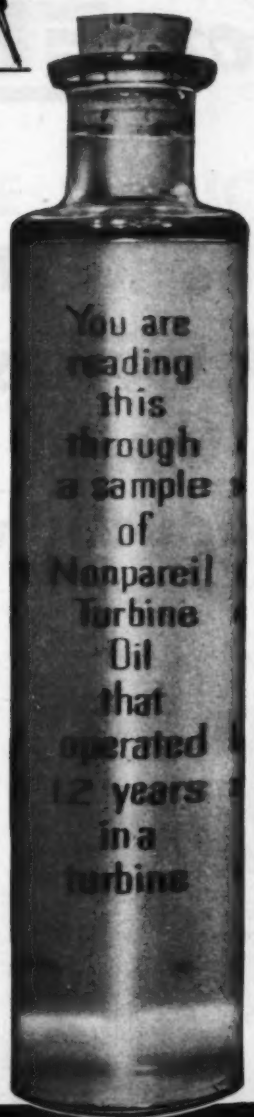
CHLORINE

There is a message for you in this turbine oil sample

A life-size unretouched photograph



Of course, the picture doesn't tell the whole story, so here are the facts.

The sample illustrated is from a fill of oil installed in a 5000 kw. turbine, June, 1933. Since then, the turbine has operated regularly, yet this fill of oil—

- has never been removed from the turbine oil system for treating or resting.
- has only been filtered through a bag-type filter.
- has shown no sign of rust or corrosion.
- has Tag-Robinson color of 16.
- has the extremely low neutralization number of .04 mg. KOH/gm.
- has an indefinite period of the same clean, acid-free operation ahead—it is guaranteed for the life of the turbine.

Compare this record with the time, trouble and expense of maintaining a fill of oil for 12 years in your plant. Compare also the years of guaranteed satisfaction still available in this fill of Nonpareil Turbine Oil. Wouldn't it pay you to change to Nonpareil Turbine Oil now?

A Standard Oil Lubrication Engineer will be glad to answer any questions you have about Nonpareil Turbine Oil. Call the local Standard Oil Company (Indiana) office, or write 910 South Michigan Avenue, Chicago 80, Illinois.

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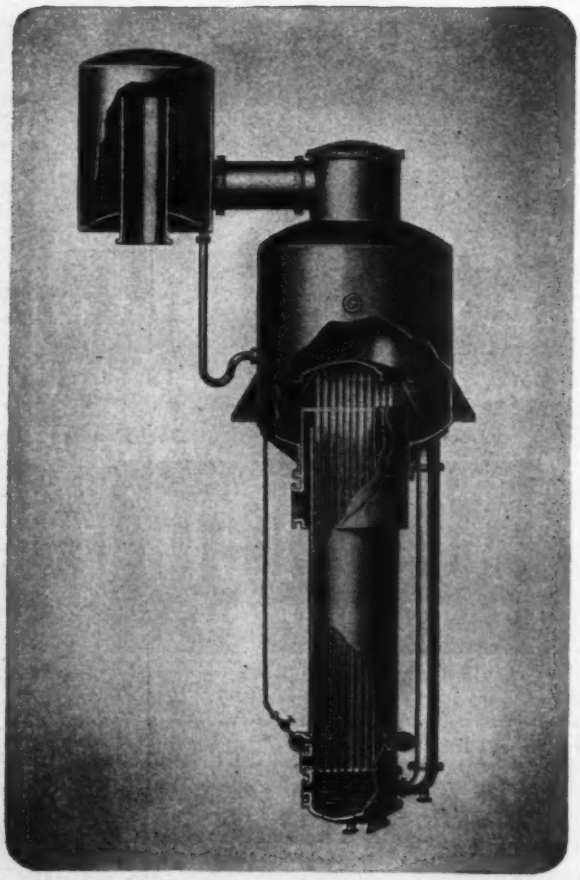
TURBINE OIL

STANDARD OIL COMPANY (INDIANA) STANDARD SERVICE

★ LUBRICATION ENGINEERING

GENERAL for ENGINEERED

The KEYNOTE of Conkey Evaporator Design is the "Reduction of Down-Time"



Recognizing "down-time" as fatal to production schedules and low cost operation, Conkey evaporator designs reduce that hazard to a minimum by providing:

Simplicity of design for dependable operation

Correct piping and controls

Accessibility

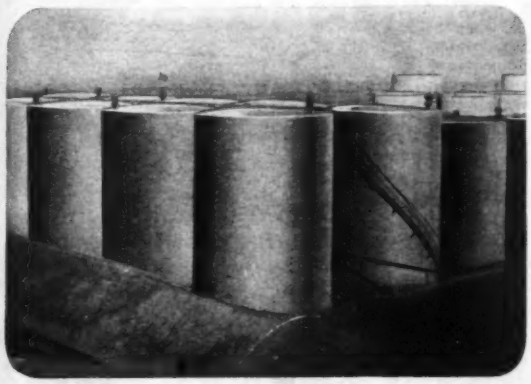
Other special features of Conkey evaporator design assure minimum entrainment losses; high heat transfer; entirely automatic control, giving dependable operation, low maintenance and minimum supervision.

Conkey evaporator equipment for pulp mills comprises a modern line for multiple effect economy in the concentration of soda and sulphate black liquors; forced circulation high concentrators for carrying concentration to ultimate high density, and improved recirculation types for the concentration of sulphite mill waste liquors.

When planning the installation of evaporator equipment, remember that Conkey Evaporators are designed by engineers experienced in pulp mill processes. The materials of construction are selected by metallurgists familiar with the various metals necessary for successful operation. Fabrication is in shops containing up-to-date equipment. Supervision is by men who have for years built equipment to meet exacting operating and process requirements.

Ask one of our engineers to go over your problem with you.

AMERICAN EQUIPMENT!



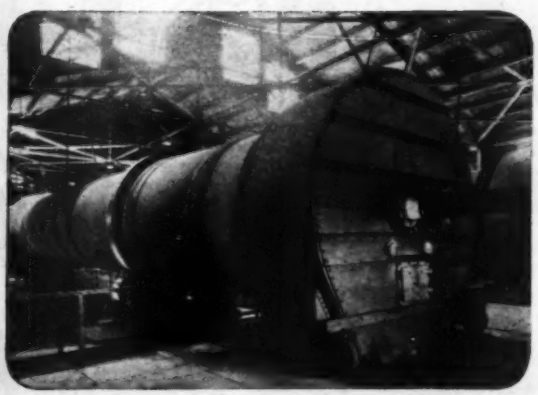


PLATE FABRICATION
Either Welded or Riveted

The General American line also includes a long and diversified list of plate fabricated products manufactured by the Plate & Welding Division at Sharon, Pennsylvania.

The Plate & Welding Division makes custom-built products, precision-built to customers' own designs, as well as standard products on which it has had years of highly specialized experience. These products include accumulators, crystallizers, dissolvers, heat exchangers, absorption towers, condensers, rotary kilns, pressure vessels, digesters, storage tanks for any commodity, and many other types of plate fabrication, either welded or riveted.

General American is prepared to build equipment in any steel, alloy or other metal. Pressure vessels are designed and tested to any required standard—ASME, API-ASME, State, or other Codes . . . field-erected storage tanks are built to customers' specifications or API Code.

In addition to its exceptionally large manufacturing facilities, General American maintains complete X-ray equipment, heat-treating and stress-relieving furnaces, as well as a staff of experienced engineers and scientists with extensive research, development and testing laboratories.

If you need any sort of fabricated equipment, investigate General American, and its ability to serve you. Technical information will gladly be sent you on request.

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General Sales Offices: 514a Graybar Bldg., New York 17, N. Y. ● *Works:* Sharon, Pa., and Louisville, Ky.
Sales Offices: Chicago, Sharon, Louisville, Cleveland, Pittsburgh, St. Louis, Salt Lake City, San Francisco, Tampa, Washington, D. C.

THE EVOLUTION OF POWER

MANPOWER appears to have been the only form of energy used in the erection of the pyramids of Egypt. Man's burden, however, was partly eased by application of the principles of the lever and of the inclined plane.

WATERPOWER was employed about 19 B.C., when the first known undershot waterwheel was built at Rome. However, it never became popular until the use of slave labor declined in the 300's. A pioneer water turbine was designed by Leonardo da Vinci about 1500.

ANIMAL POWER turned the huge grist mills of ancient Pompeii. The animals were yoked to the mills in such a way that they could not eat the grain as they turned the querns.

WINDPOWER was brought into use about 150 B.C., when Hero, of Alexandria, Egypt, devised a windmill to operate a music organ. The idea for Europe's first windmills, however, probably was brought from the East by returning crusaders in the 11th or 12th centuries.

STEAM engines built by Newcomen early in the 1700's laboriously pumped water from English mills. After working on one of these crude, reciprocating steam engines, Watt introduced the innovations that made steam commercially profitable to use.

ELECTRIC POWER was used in the United States as early as 1835 when Thomas Davenport, a Vermont blacksmith, made and operated an electromagnetic motor, which lifted a weight of 88 pounds.

ATOMIC ENERGY

CAN IT BE HARNESSED BY MAN FOR THE PROGRESS OF INDUSTRY?

TRADE WINDS

Expansion Announcements

WEYERHAEUSER TO EXPAND AND DOUBLE THE CAPACITY OF ITS LONGVIEW PULP DIV.

Expansion and improvement of the Longview (Wash.) plant of the Weyerhaeuser Timber Company's pulp division to double its present capacity and provide 250 additional permanent jobs are planned for the immediate future.

J. P. Weyerhaeuser, Jr., executive vice president of the company, made the announcement. He did not state the cost of the project, but construction sources outside the company estimate it will be in the neighborhood of $5,000,000.

The program consists of a complete conversion of process in the present sulphite mill, which has an annual capacity of 90,000 tons of bleached sulphite, the addition of an entirely new sulphite pulp plant with an annual capacity of 70,000 tons of bleached sulphate, the construction of a new steam and power generating unit and the addition of two hydraulic log barkers.

The decision to proceed with the program now, just as promptly as possible, represents the fruition of plans which have been developing for several years, but held in reserve during the war. Capital reserves to cover the increased investment have been accumulated by Weyerhaeuser Timber Company over a period of years as part of a long range policy based on progressive improvement of plant and refined utilization of forest resources.

In making the announcement, it was pointed out that additional employment opportunities for returning veterans will be provided at a time when such opportunities are most needed.

The surprising and significant feature of the whole program is found in the major step forward in wood utilization. This step has two parts. The existing sulphite pulp mill will continue to turn out its present tonnage, but with 15 per cent less wood, and in addition will provide virtually all its own steam and power requirements. The new sulphate pulp mill will manufacture 70,000 tons of additional pulp annually and supply much of its own steam and power without calling for any enlargement of the present areas being logged. This somewhat phenomenal accomplishment will be the fruit of improved and integrated wood utilization practices in forestry, logging and milling.

The wood requirements will largely be drawn from the company's own forest lands, which have been and are being established as tree farms under a permanent cropping forest management basis.

In detail, the program announced today includes the following major units:

1. The present bleached sulphite pulp mill will be converted from a lime base process to a magnesium base process. This will mean no change in the pulp producing capacity of the plant, nor in the type of pulp produced. The new process, first commercial installation of its kind, will improve plant efficiency in two principal ways: (1) conversion of organic materials in the waste liquor into steam and power; (2) recovery of the principal basic chemicals.

The waste resulting from the sulphite pulping process has for a long time been known to contain approximately 50 per cent weight of the raw wood bulk entering manufacture. By converting to the magnesium base process, it becomes possible economically to evaporate the liquor and burn the organic materials for the production of heat and power. At the same time, the new process will also permit recovery of about 90 per cent of magnesium oxide and sulphur, the basic heavy chemicals used in the production of the pulping acid.

The values so recovered will supply virtually the total heat and power needs of the converted sulphite pulp mill, and in consequence represents a long step forward in wood utilization.

Previously all the steam and power requirements of the pulp mill have been supplied by the power mill plant operated by the Lumber Division.

Conversion of the sulphite mill will be carried on without interruption to present production. When the necessary facilities have reached a certain stage, the switch from the old process to the new will become immediate.

The new process was worked out by the Pulp Division's Research Department and carried through a successful pilot plant demonstration. At about the same time the experiments were going on at Longview, a similar investigation was being carried out by the Howard Smith Paper Company of Cornwall, Ontario, under the direction of G. H. Tomlinson with the co-operation of the Babcock and Wilcox Company.

Subsequent study of the results obtained in Canada and in Longview convinced the Babcock and Wilcox Company of the unique features of the process and, as equipment manufacturers, they arranged to take over the sale of the process.

2. The bleached sulphate pulp plant will comprise largely an entirely new set of buildings adjacent to and in part combined with the existing sulphite mill. The main elements of the plant will consist of chipping plant and storage facilities, recovery furnace, lime kiln, evaporators, digesters, screens, washers, bleach plant, drying machine room and warehouse.

The present machine room will be extended by an addition 50 ft. x 375 ft. and an additional drying machine will be installed. The plant will be equipped to produce bleached sulphate pulp of the highest quality.

Far-reaching refinements in wood utilization in the overall Longview operations of the company are expected to yield from current wastes the entire supply of wood needed to bring in the 70,000 tons of pulp to be manufactured by this new unit annually.

3. An entirely new power house will be constructed in the area northwest of the present plant. It will consist of an integrated boiler house, one-half of which will utilize waste liquor from the converted sulphite mill, and one-half of which will utilize liquor from the new sulphate mill.

The generating equipment will consist of two steam turbines with a total rated capacity of 10,000 kilowatts. Steam will be generated at high pressure, 600 pounds psi. Wood now used for fuel at Longview to supply the Pulp Division's power and steam needs will be diverted to other uses by the company after completion of the new power house.

4. The new hydraulic barker and whole log chipper, presently under construction adjacent to the log pond, will be completed by December 1, 1945. A similar log barking and chipping unit has been in operation at the company's sulphite pulp mill in Everett, Washington, for about three years. The present installation, which will utilize commercial log sizes, will largely duplicate this earlier installation at Everett. The barking process was the product of several years' engineering research by the Pulp Division.

The hydraulic method of barking large logs will result in saving in excess of 15 per cent of sound wood because the waste in the form of saw kerf and wood taken off with the bark by mechanical means will be eliminated.

5. A new type small log barker, to be ready for operation next April, and of hydraulic jet principle, will be installed, to handle cordwood of all species in 8 foot lengths, and in diameter ranging from 4 in. up to 16 in. The installation will permit the recovery of sound wood heretofore denied an economical outlet in the normal process of logging. In effect, installation of the small log barker, together with certain other refinements, is expected to improve the utilization of wood per acre of forest land by 30 per cent by making use of present logging waste and thinnings in young forests.

Execution of design and supervision of construction will be under the direction of the company's consulting engineer, O. C. Schoenwerk, Chicago, who also served in similar capacity in construction of the Pulp Division's present plants at Longview and Everett.

The improvements and additions in the program as a whole will require an estimated 1,360,000 man hours of local labor. This figure refers to the construction phases alone. Expenditures made locally will be supplemented by purchase of certain materials and services.

Principal source of new permanent employment will be in the new sulphate pulp mill. The net addition to operating crew will be approximately 250 employees. This will represent an annual estimated payroll of $800,000,00, which will in effect be double the present annual payroll.

◆

CHAMPION'S EXPANSION PROGRAM WILL BOOST PRODUCTION AT CANTON

Plans for a $5,000,000 expansion program which will boost the daily production capacity of the Canton (N. C.) division of the Champion Paper and Fibre Company to more than 1,000 tons of chemical pulp, paper and board products have been announced.

The ambitious expansion program, expected to be completed during the early part of 1946, will involve a number of alterations and additions to the huge Canton plant, the installation of several modern pieces of equipment and the inauguration of a new manufacturing process designed to utilize southern pine wood in papermaking.

When completed, the plant expansion will make possible an increase in pulp capacity of 50 tons per day and will boost paper and board production approximately 120 tons per day. These increases will swell the daily chemical pulp tonnage to more than 600 tons and the paper and board products to something over 450 tons.

One of the major items of the expansion program will be the completion early in October of a new chemical recovery unit, work on which is already under way. Also scheduled is the installation of a new pulp bleaching unit, a 7,500-kilowatt turbine and a modern high pressure steam boiler unit.

A new fourdrinier paper manufacturing machine, costing approximately $2,000,000, will also be installed to handle the substantial production increase. The new machine will be similar to one already in use in the book mill manufacturing area.

As a parallel development to the expansion program, the Champion company plans to convert its sulphite pulp process to a bleached sulphate pulp process in which southern pine wood as well as hardwoods can be used successfully. Present wood supplies are adequate to care for present and future operations, company officials declared.

Mr. Robertson also announced plans for the construction of a modern cafeteria for the benefit of Champion employees as soon as building materials and kitchen and dining room equipment are available.

Company officials made no announcement as to whether the expansion will result in hiring of additional employees. The Canton plant at present employs more than 2,300 persons.

The current expansion program climaxes 10 years of remarkable growth on the part of the Champion company. During this period, paper and board production has increased approximately 60 per cent and chemical pulp production has rocketed some 80 per cent.

◆

GREAT LAKES PAPER CO. STARTS MODERNIZATION PROGRAM AT FORT WILLIAM

Contemplated repairs and alterations for the Fort William (Ont.) plant of Great Lakes Paper Company are estimated to cost $150,000 and comprise modernization of the acid plant, sulphite screen room and wood-handling facilities. Work is now under way on a pulp storage building, which is to cost $60,000, in addition to which $165,000 is to be spent on equipment. The new equipment will include a Flakt pulp dryer, which will be housed in a new building of structural steel construction, estimated to cost $70,000. The present program of improvements is expected to reduce the cost of handling and delivery of the company's export pulp production.

PAPER · · · America's 6th Industry

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(NEWS ITEM: *Paper-base laminates are being used for insulation of electrical apparatus.*)

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With War contracts cancelled, the Puseyjones Organization is already devoting itself completely to peace-time production—to the design and construction of Paper Making Machinery built to new high standards of speed and efficiency, and to the modernization of existing machines.

The Puseyjones Research and Development Committee, formed within this Organization to help in our service to America at War, now shares with the Paper Industry many of the lessons learned in the use of new materials and new techniques—and which are now so co-ordinated as to be of practical, workable value.

Our engineers are on call to survey your requirements.

A New Bulletin—"The Improved Puseyjones Steam Joint" is now available. Also a descriptive pamphlet on the improved Steam Flow Vat System . . . Yours on request.

THE PUSEY AND JONES CORPORATION
Established 1848. Builders of Paper-Making Machinery
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ST. REGIS CO. PLANS FOUR MILLION DOLLAR EXPANSION AT DEFERIET (N. Y.) MILL

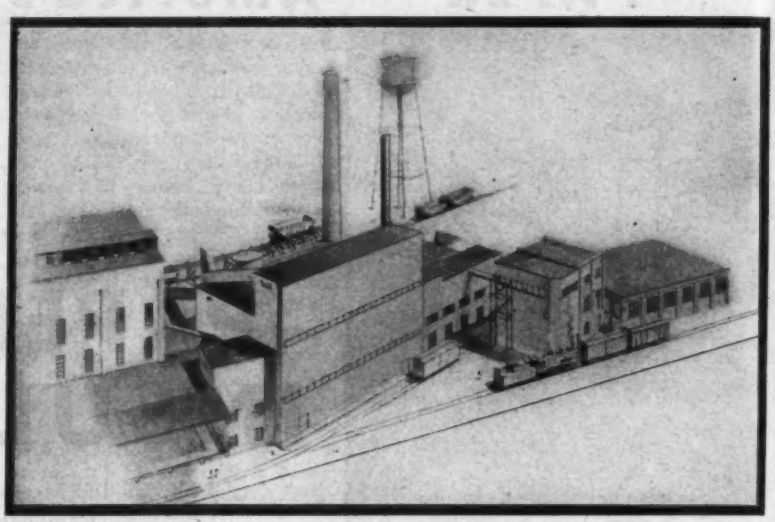
An annual increase of more than 30,000 tons of bleached groundwood magazine and printing papers will be produced by St. Regis Paper Company through the $4,000,000 construction and expansion program which has been started at the Deferiet, New York, pulp and paper mill of the company's Printing and Publication Paper Division. This announcement was made by Roy K. Ferguson, president of St. Regis.

The increased volume will be in supercalendered, machine finish and machine coated groundwood papers.

The Deferiet program provides for the initial large-scale production of bleached groundwood pulp by the new sodium peroxide process. This was developed during seven years of research by duPont scientists and has been adapted to large volume production for the first time in collaboration with St. Regis paper technicians, Mr. Ferguson stated.

R. K. Ferguson, President of St. Regis Paper Company

New construction and expansion, approved by the WPB, includes installation of a high speed 218-inch fourdrinier paper machine; expansion of production facilities for bleached sulphite and bleached groundwood pulps; installation of a battery of the latest type Roberts' grinders; construction of a new power plant and electrical distribution system; and construction of a new bleaching plant.



Steam power improvements at Deferiet mill as shown by artist's drawing

George A. Fuller Company, New York, is handling the construction work, while Charles T. Main, Inc., Boston, is engineer.

For the manufacture of sulphite pulp, the addition of a 14 ft. by 45 ft. digester, in the same building as the three existing 14 ft. by 38 ft. digesters, will completely integrate the mill as to wood supply, pulp and papermaking capacity. This fourth unit will provide the necessary flexibility in pulp production to schedule economically combined hard and soft wood operations.

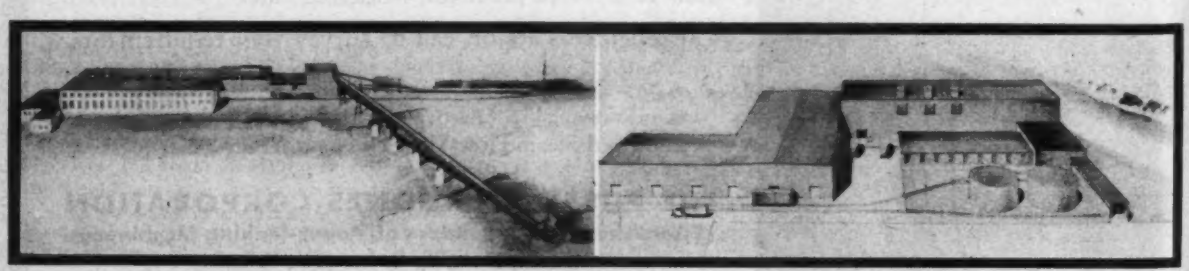
Timberlands owned by St. Regis in New York State and New England total 350,000 acres. In Canada the company owns more than 200,000 acres and controls another 100,000 acres under Crown leases. It is estimated that the company-owned timber lands contain over 4,000,000 cords of pulpwood.

These sources of wood will supply the new operations and the company's other groundwood paper mills in northern New York.

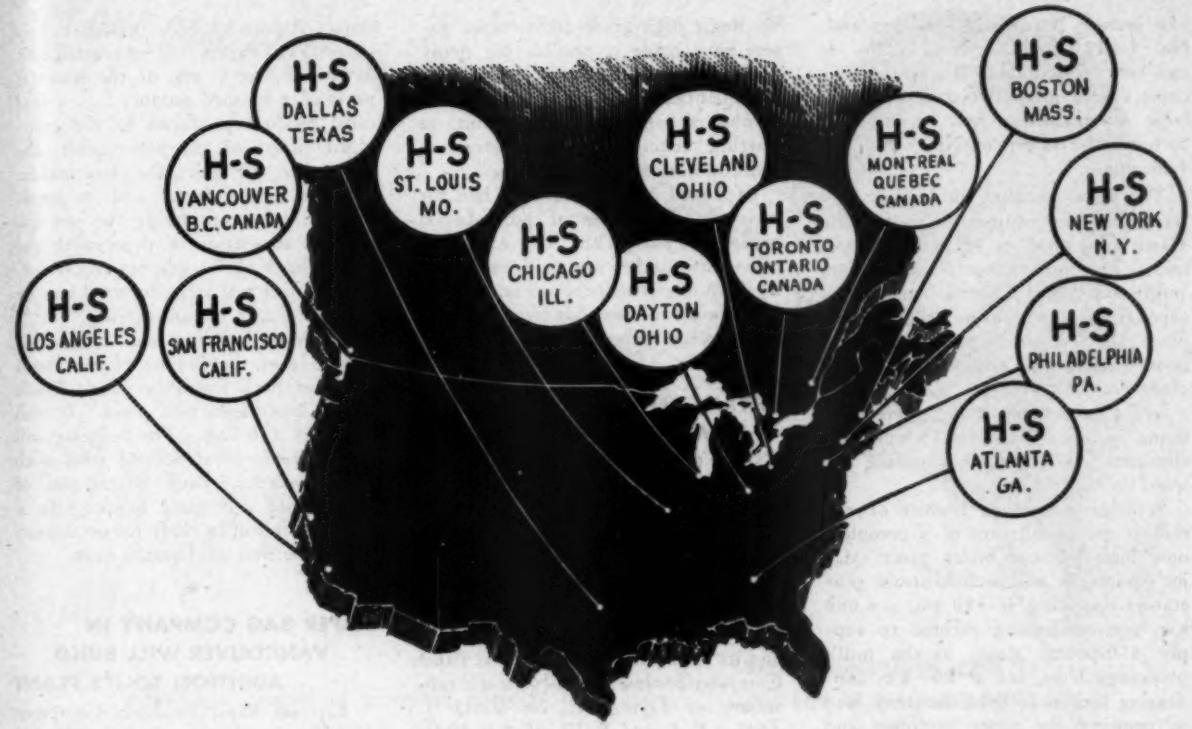
Since any one or a combination of a dozen local woods can be used in the mill, the supply of pulpwood will be reinforced by heretofore untapped local sources. The project will mean the return of many Adirondack woodlands and farming acres as sources of wood pulp. It is expected that the program will encourage the growing of wood as a business by both small and large landowners.

The Deferiet mill's new No. 6 paper machine, the giant 218-inch fourdrinier, formerly operated at Algonquin Paper Company's Ogdensburg, New York, plant, will be partially rebuilt for installation in a new building now under construction. Integrated with Deferiet groundwood and sulphite production, the machine will be designed to operate to 1200 feet per minute and produce 104 tons per day of paper. The machine includes an 80-foot long fourdrinier wire section and thirty-four 212-inch wide by 48-inch diameter dryers.

The other existing machines and their wire widths are: No. 1—145 inches; No. 2—126 inches; No. 3—



LEFT—Sketch showing groundwood mill improvements at Deferiet mill of St. Regis. . . . RIGHT—The new building which will house No. 6 machine



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For repairs, adjustments or parts, call the nearest Harris-Seybold office, indicated above. The Harris-Seybold-Potter Company, General Offices, Cleveland 5, Ohio.

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156 inches; No. 4—160 inches; and No. 5—121 inches. No. 1, No. 4 and No. 5 machines will produce machine coated groundwood paper. Two large supercalenders will be installed to finish the output of No. 3 and No 4 machines.

The wood handling project at Deferiet includes equipment to furnish 4-foot pulpwood to the groundwood mill. The mill formerly used 2-foot pulpwood. Six Roberts' magazine-type grinders will be installed to replace the 28 three pocket grinders now in operation. Other additions include heavier conveyors, a new drum, a larger storage pit, and a conveying flume for the 4-foot logs which will eliminate all manual handling of wood in the plant.

Another important feature of the mill is the installation of a complete new high pressure boiler plant. Major equipment will include steam generators operating at 850 psi, a 6,000 kw. non-condensing turbine to supply 150-pound steam at the mill's processing level, and a 5000 kw. condensing turbine to hold the steam load in running the paper machines and vats. Estimated cost of the steam and power distribution improvements is one and one-quarter million dollars. Supplementary off-peak power will be bought from the Niagara-Hudson Power Company.

Approximately 12 million gallons of water per day from the Black River adjacent to the mills will be used in the mill operations.

C. B. Martin, vice president in charge of operations, and Lyman Beeman, earlier this year appointed overall superintendent of a group of St. Regis mills, have their headquarters at Deferiet. Other key personnel at Deferiet include Edward Marshall, mill manager; P. J. Baron, chief engineer; Fred C. Goodwill, technical director; and D. C. Mather, chief chemist.

Sale of the augmented volume of bleached groundwood paper will be directed by E. G. Murray, Manager of Paper Sales, located at the company's main offices, 230 Park Avenue, New York.

Production includes book, magazine, catalogue, directory, writing, mimeo and communications papers. Lightweight groundwood papers are being used for a great variety of printed matter, including manuals, bibles, pocket books, national magazines, and for the overseas editions of *Time*, *Newsweek* and *Life* magazines, where opacity, strength, light weight and excellent printing qualities are important factors.

In the paper conservation program, St. Regis high-grade lightweight papers have made it possible for many publications to maintain their printing qualities and to carry the same number of pages, while conforming to wartime requirements by decreasing consumption of paper tonnage.

Expanded applications have laid the basis for wider uses of groundwood paper postwar. Thus the expansion plans now under way will enable St. Regis to meet the increased and broadened postwar demands for bleached groundwood papers.

◆

BRYANT BEGINS WORK ON NEW LAB. TO BE DEVOTED TO GRAPHIC ARTS RESEARCH

On September 5 construction was started on what is expected to be one of the most modern and complete research laboratories in this country. This new laboratory is being built by the Bryant Paper Company, Kalamazoo, to carry on research work for Time, Inc., and its subsidiaries. (*The Bryant Paper Company became a wholly-owned subsidiary of Time, Inc., on March* 1, 1945. *P. I. and P. W. March*, 1945, *p.* 1539.)

The laboratory will be devoted principally to research which will contribute to the progress of the graphic arts industry. Allan B. Milham, president of Bryant, states that in this laboratory papers will be created not primarily to have a superior appearance, but because they possess the necessary qualities for the use which awaits them.

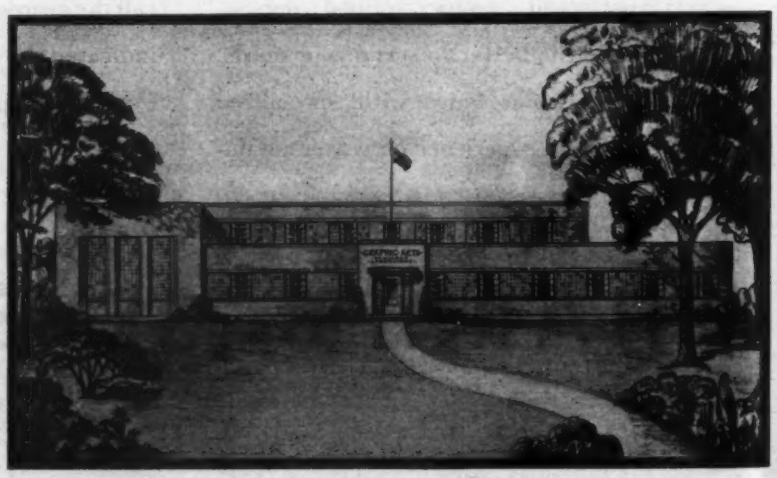
Responsible for the new project is D. Robert Erickson, who will direct the research. Mr. Erickson formerly was with Michigan Research Laboratories, Kalamazoo. He has been in private engineering and chemical consulting and research work for some time. Research Director Erickson states that "Papers will be created and developed here as one of the essential parts of a finished product . . . a finished product produced by the combined efforts of the papermaker, the ink maker, the artist, the plate maker, the press manufacturer, and the pressman . . . By considering the end use and the association of paper with the other phases of the graphic arts industry, we feel real steps forward can be made in paper manufacturing."

The new building will be located across from the Bryant plant; about 125 feet back from the street, beside nicely landscaped mill pond. It will be 60 by 120 feet. The building will be fireproof, of structural steel with brick exterior, with liberal use of glazed tile and glass blocks. It is expected it will be ready for occupancy about the first of January next.

◆

PAPER BAG COMPANY IN VANCOUVER WILL BUILD ADDITION TO ITS PLANT

Bartram Paper Products Company, Ltd., is planning to erect a $200,000 addition to its paper bag manufacturing plant at Vancouver, British Columbia. The addition will provide employment for an additional 100 workers and will be used in the production of paper products. The plant will be erected in the block between Franklin and Hastings Streets, Woodland and McLean. Delay in starting the project is being experienced, however, because the Vancouver city council is hesitating to grant the firm's application for the purchase of the land dividing its property in this city block. If the lane could be purchased by the company the new building could be joined up to the present factory.



Architect's drawing of new Time, Inc., graphic arts research laboratory now being constructed by Bryant Paper Company

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JLMCo CI-J2

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If you make or use Stainless parts, investigate the Stainless Surface Hardening Company's efficient new process. Gives up to 1100 Brinell surface hardness. Combines the corrosion resistance of Stainless with the abrasion resistance of a nitrided surface.

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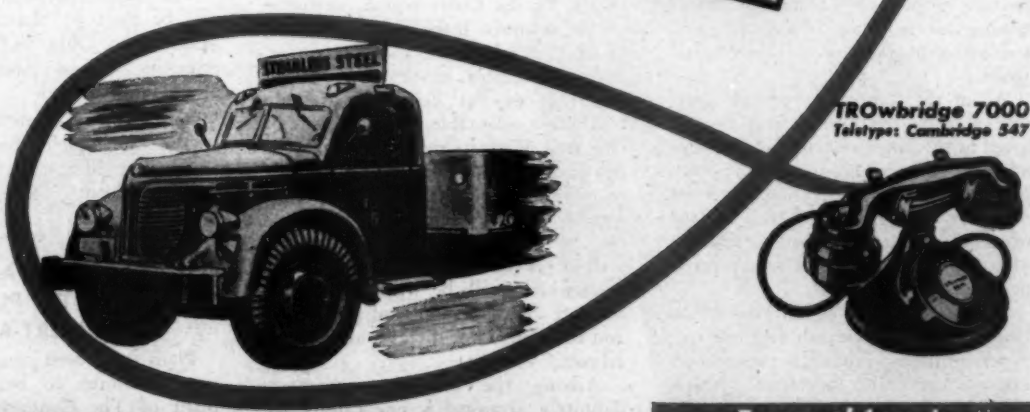

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INDUSTRIAL STEELS INC.

Everything in Stainless

Architect's drawing of new Mando Research laboratory

M AND O TO BUILD NEW LABORATORY AT INT. FALLS

The construction of a central research laboratory building on the United States—Canadian border at International Falls, Minnesota, and expansion of the present research staff to include additional chemists, physicists and engineers, is announced by the Minnesota and Ontario Paper Company, Minneapolis, Minnesota.

Construction of the building is under way and completion is expected in the early spring. This is a part of the $6,000,000 expansion and modernization program recently announced for Mando plants and facilities at International Falls, Minnesota, and Fort Frances and Kenora, Ontario.

The laboratory will be two stories high, 140 feet wide and 95 feet deep, and will consolidate the present research activities.

"The size of the laboratory will exceed 300,000 cubic feet and additional space, when needed, will be provided by adding to the building," M. S. Wunderlich, Director of Research, said. Dr. J. O. Burton will be in charge, with Mr. Wunderlich maintaining his headquarters at the general offices of the company in Minneapolis.

All of the company's research projects will be centralized and coordinated in the improvement and development of present products and processes and in the utilization of wood products heretofore not used in the manufacture of paper, structural insulation board and other forest products.

The building will contain individual laboratories and research facilities for paper, pulp, by-products, paper coating, structural insulation board, physics and physical instrumentation, humidity and low temperatures, and space for the installation of pilot plants.

Before final plans for the building were drawn, visits to other research laboratories of the country were made by Mando engineers who made extensive studies before co-ordinating present and future needs of the company into the plan.

"Completion of the laboratory will expedite research as to full utilization of the wood harvest, particularly the faster growing trees," Mr. Wunderlich said. "The wide variety of species of trees growing in Northern Minnesota and in Ontario offers an interesting challange to a modern research program," he said. "We intend to conduct full research into the manufacture of new products from what is now considered 'waste material.'"

◆

PULP MILL MACH'Y WILL BE BUILT IN VANCOUVER

New improved pulp mill machinery, including hydraulic barkers of the latest type, will be built at Vancouver for British Columbia's pulp industry. With the rapid growth in the manufacture of pulp from the softwoods of the Pacific Coast region, engineers of the Sumner Iron Works, of both Everett, Washington, and Vancouver, British Columbia, have paid particular attention to the designing of pulp machinery adaptable for the needs of this area. With its new, modern, well-equipped plant in Vancouver, capable of manufacturing machinery of the size and capacity suitable for any mill, the Sumner organization has plans well advanced to meet increased business which will be available as the pressure for the supply of machinery and equipment for direct war purposes relaxes.

Among the important contracts definitely arranged is one calling for the future construction of hydraulic barkers as developed jointly by the engineers of Crown-Zellerbach Corporation and of the Sumner organization. The equipment will be built in Everett for the U. S. plants, and by Canadian Sumner Iron Works in Vancouver for Canadian plants of Crown-Zellerbach.

◆

WEST VIRGINIA P. & P. BEGINS MODERNIZATION AT ITS COVINGTON PLANT

A modernization program has been started by West Virginia Pulp and Paper Company (New York City) at its Covington, Virginia plant, with The Rust Engineering Company, Pittsburgh, acting as contractor.

The major project is the installation of a system of sluice-ways to take the place of existing mechanical facilities for handling incoming pulpwood. This system, designed by West Virginia Pulp and Paper Company engineers, will carry pulpwood from the cars to storage and then to the mill, or directly from the cars to the mill; and will reduce maintenance and labor costs substantially.

Estimated cost of the program is in excess of $500,000.

◆

NEW BOARD MILL UNDER WAY AT MICHIGAN CARTON CO.

The construction of a new board mill, adjacent to its present plant, has been announced by Michigan Carton Company, Battle Creek, Michigan.

The paperboard machine proper will be built by Beloit Iron Works, Beloit, Wisconsin. It will be a high speed machine with several newly developed features, including a machine coating process to be operated under the K. C. M. license.

The stock preparation equipment will be built by Shartle Brothers, of Middletown, Ohio, and is designed for economic use of labor, being thoroughly mechanized.

Power plant contracts have been let to Springfield Boiler Company, Springfield, Illinois, and General Electric Company, Schenectady, New York.

◆

CONTAINER COMPANY TO EXPAND ITS PLANTS AT VAN WERT AND READING

Plans have been completed for two new buildings to be added to the plant of The Container Company, a division of Continental Can Company, at Van Wert, Ohio.

The new factory building will con-

Buying Interest is Focused *on the*

OLIVER

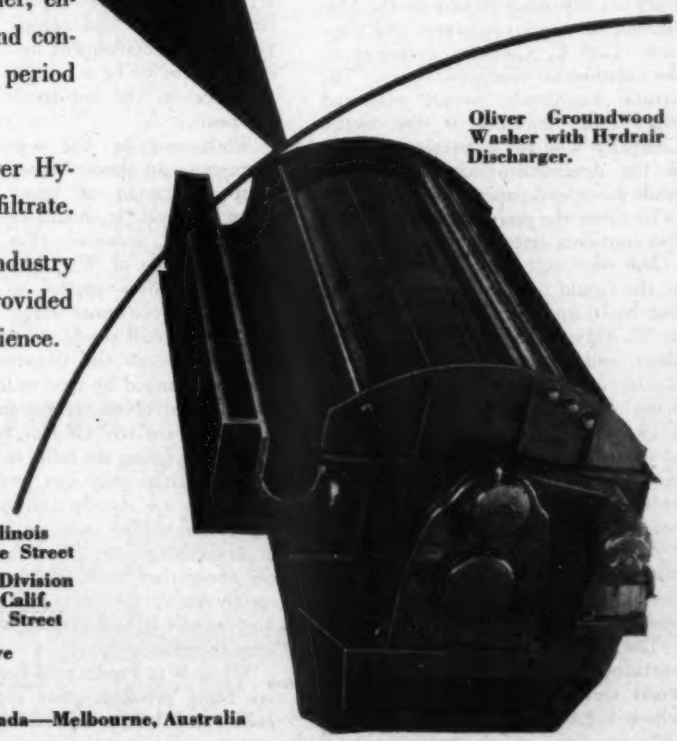
GROUNDWOOD WASHER

THE pulp and paper indus[illegible] bleaching" conscious. And whe[illegible] cessing step became the accepted prac[illegible] turned to Oliver United for the necessary [illegible] washer. The industry wanted the best that ex[illegible] in continuous vacuum filtration could provide.

Here it is, the OLIVER Groundwood Washer, entirely rubber protected to prevent corrosion and contamination. Several units, in operation for a period of years, have proved the worth of this filter.

This unit offers the advantages of the Oliver Hydrair Discharger and facilities for separating filtrate.

So, once more when the pulp and paper industry required a new type of filter, Oliver United provided the engineering skill and manufacturing experience.



Oliver Groundwood Washer with Hydrair Discharger.

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San Francisco 11, California

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Western Sales Division
Oakland 1, Calif.
2900 Glascock Street

Canada: Sales & Manufacturing Representative
E. Long Limited
Orilla, Canada

Factories: Oakland, Calif.—Hazleton, Pa.—Orilla, Canada—Melbourne, Australia

sist of two warehouses for raw materials and finished stock, a mezzanine floor, metal parts department, offices, etc. The new research and engineering building, two floors and basement, will be air-conditioned and equipped with special temperature and humidity controlled test rooms. This building will be the headquarters of all engineering research and design of both product and equipment development for the paper division.

Constructions contracts also have been placed by the Container Company division for an addition to the Reading (Pa.) plant which will double present operations. New equipment is to be installed for a second Leverpak production line with increased capacity. Metal parts which have been previously furnished by the company's plant at Van Wert will now be manufactured at Reading.

◆

GOULDS PAPER CO. SOLD TO CONTINENTAL CAN CO.

One of the few remaining completely integrated paper manufacturing companies in the United States changed ownership on September 6 when the Gould Paper Company, Lyons Falls, New York, disposed of its entire common holdings to the Continental Can Company, Inc., New York City.

The Continental Can Company, Inc., is one of the largest producers of metal containers and during recent years has expanded rapidly in the production of paper containers and plastics. Carl C. Conway, president of the Continental company, states, "The natural woodlands, power, pulp and paper mill resources of the Gould Company will be of particular value in the development of special high grade pulps and paper process required to continue the perfections of our general container lines."

Not only will the present personnel of the Gould organization be retained and built up under the direction of R. W. Shaver, who has served as president and general manager of the Gould company, but rehabilitation plans call for the expenditure of $750,000 to $1,000,000. This will go into the rebuilding of machines and processes, as well as plant improvements which are planned to meet the needs of the postwar period.

Mr. Shaver will continue with complete responsibility for the management of all departments of the business.

The Gould company, however, will continue to manufacture the groundwood specialties and printing papers which the company has been making since it discontinued the production of newsprint at the end of June following 51 years of making that grade of paper.

The Gould Paper Company was founded by Gordias H. P. Gould with its incorporation in 1892, but the paper mill at Lyons Falls was not built until 1894.

◆

GROUND IS BROKEN FOR NEW PLANT OF THE WESTMINSTER PAPER CO.

E. M. Herb, president and general manager, F. J. Herb, vice-president, and J. J. Herb, founder, recently participated in the turning of the first sod for the new plant of Westminster Paper Company at New Westminster, British Columbia. When the new plant is completed the output of the company will be doubled and its payroll increased from 335 to 410.

The $1,250,000 building program calls for extension of the finishing room, which will be 111 feet by 126, three stories high, and of reinforced concrete. The new wharf is finished and gives direct loading access for deep sea ships. Bulkheading the property along the waterfront is completed. Ninety per cent of Westminster Paper Company's products are sold in Canada.

◆

▶▶▶ WORK HAS BEGUN on the expansion program at the plant of Crown Willamette Paper Company, West Linn, Oregon (Cf. P. I. and P. W., August, 1945). Ground was broken on August 26 for the firsts unit of the employees' locker room. As previously announced, the company plans a $15,000,000 construction and expansion program for its plants at West Linn (Ore.) and Camas (Wash.)

PAPER INDUSTRY FACES RECONVERSION PERIOD IN CHAOTIC POSITION

The end of the war in Japan, coming so unexpectedly early with the one-two blows of atomic bombs on Japan leaves the paper industry in a chaotic position, and it is "anybody's guess" as to what will happen in the next few months, and in the longer period to follow. Some anticipate a period of inflationary prices, others expect labor problems and reconversion with consequent unemployment to be a bearish influence on the industry's prospects.

With end of the war there came an almost immediate revocation of many paper controls. It should be remembered, however, that the revocation of War Production Orders applies so far only to consumer usage, and not to mill production. In other words the situation, which may be changed by new orders at any moment, involves permission to consumers to use any kind of paper they desire, but limits the mills to the kinds and quantities they can produce. Big magazines are already anticipating expected circulation increases with higher advertising prices, but the question of where they will get the paper to supply the larger volume of readers is not yet solved, and cannot be for some time to come.

While War Production Board orders are being revoked, price control still exists, and there is no reason to believe that the Office of Price Administration will commit suicide by dropping its supervision of the markets and curtailing its force.

Washington is inclined to be optimistic as to the future. The paper industry can see difficulty ahead. Paper salvage campaigns are already being dropped, prisoners of war who have been cutting at the rate of 3,000,000 cords a year are being returned to farm work or to their homes. Swedish pulp is coming at a rather definite rate, but not in sufficient volume to compensate for the lost raw material from the waste paper and pulpwood fields. Meanwhile, pulp allocation continues.

Demand for paper will undoubtedly be extremely heavy, if for no other reason than to replenish consumers' and jobbers' inventories. Removal of price controls would result in higher prices for paper, but on the other hand maintenance of controls prevents mills from making many grades of paper which could be marketed at a reasonable price, but not now produced because of inability to meet manufacturing costs. Consumers, because of this situation have been forced to take higher grade papers than they wish, but higher priced paper or none is the dilemma they face.

The entire industry is distorted by production and price controls, but a return to a normal basis of meeting demand with supply is certain to come sooner or later. Many manufacturers would prefer to have the problem

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Albuquerque's Mayor, Clyde Tingley, states that the "motor's performance is excellent . . . a quiet-running enclosed motor . . . doing a dependable job." Mayor Tingley voices the opinion of many thousands of other satisfied users of large a-c motor drives built by E-M.

E-M Induction Motors can be supplied with special electrical and mechanical modifications to meet power service and motor application needs . . . starting and running torques are available to handle heavy torque requirements . . . efficiency and power factor characteristics are high. It will pay you to get in touch with your E-M field engineer on your next large a-c motor drive job!

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SQUIRREL CAGE WOUND ROTOR VERTICAL PROTECTED

"The *Extra-Value* Motor Your Drives Deserve"

A-2020

solved now, rather than hang over their heads indefinitely.

▶▶▶ PEACE HAS BROUGHT the relaxation of many restrictions on labor control, rigid control over wage decreases will continue, but workers are now free to take jobs wherever they wish. Government authorities are waging a vigorous campaign to avoid extensive unemployment, but war contract cancellations are throwing thousands out of employment, and too often the workers have not saved anything from their war-time high wage envelopes. The 48-hour work week is no longer compulsory, and industry is back to a 40-hour work week, except where conditions require a continuance of over-time payments.

▶▶▶ THE FEDERAL TRADE COMMISSION has instituted proceedings against the paperboard interests which have been operating under a program of group purchases of high-cost producers.

◆

BRITISH PAPER TRADE NOTES (BEFORE VICTORY)

Although nearly three months have passed since the end of the war in Europe the British Paper Trade is in exactly the same position as it was on VE day. In fact some mills go so far as to state that the position is even worse today than on May 8th.

Coal and manpower are the crux of the situation. The present quality of coal is extremely low and supplies are limited. The manpower position has not improved and the call-up of young people is continuing. Although a few men are being demobilized from the forces their numbers are so small as to be ineffective in relieving the acute position. The situation is aggravated by the fact that papermaking is not considered a priority industry, although it has recently been announced that Printing is now considered in a high priority position. This will not, however, affect immediately the call upon paper for many of the larger printing establishments are six months behind with their commitments. The cause here again being labor and not shortage of paper to cover these commitments. Coupled with this several of the paper consuming sections; book publishers, manufacturing stationers, etc., have been granted a slightly higher quota of paper during the present license period which the papermakers are able to meet by virtue of smaller demands from other quarters.

The arrival of wood pulp from the Baltic is confirmed by the Paper Controller's recently announced proposed increases in the quotas of paper production. While the materials are available for this increased production it is questionable whether all producers will be able to take advantage of these pulp releases owing to the fact that they have not the labour to handle it. The papers affected by these increases are the cheaper grades of printing and writing papers, parchments and greaseproof wrappings and thin sulphites.

The esparto mills, which have been boiling straw in the place of esparto grass during the past five years, are still restricted to this material as there is no news whatever of the revival of esparto grass imports from Africa.

Another section of the trade where

IMPORTS OF PULP CONTINUE

The Pulp and Paper Unit, Department of Commerce, reports that imports of wood pulp into the United States from overseas totaled 19,100 short tons during the week ended August 31, 1945.

The aggregate quantity imported from overseas sources since V-E Day through August 31, 1945, amounts to 114,366 short tons of which about 43 per cent was unbleached sulphate wood pulp (kraft), about 44 per cent was unbleached sulphite wood pulp, and about 7 per cent was bleached sulphite. The remaining 6 per cent was of mechanical pulp, bleached sulphate, and special chemical grades of bleached sulphite.

Entries of wood pulp into United States from Europe by Customs districts and country of origin, week ending August 31, 1945.

District, country and grade	Quantity Short tons	Value Dollars
Into New York District:		
From Sweden—		
Mechanically ground wood pulp, unbleached	1,587	58,455
Sulphite, unbleached	2,772	162,926
Sulphite, other than rayon and special chemical grades, bleached	155	13,092
Sulphate, bleached	56	3,982
Into Philadelphia District:		
From Sweden—		
Sulphite, unbleached	3,093[1]	189,810[1]
Sulphite, other than rayon and special chemical grades, bleached	2,084	148,909
Sulphate, unbleached (kraft pulp)	110[2]	6,174[2]
Into Maryland District:		
From Sweden—		
Sulphite, unbleached	4,694	290,186
Sulphite, other than rayon and special chemical grades, bleached	984	77,661
Sulphate, unbleached (kraft pulp)	3,565	211,768
Grand total	19,100	1,162,963

([1]) Represents in part arrivals during week of August 24, for which import entries were filed during week of August 31.

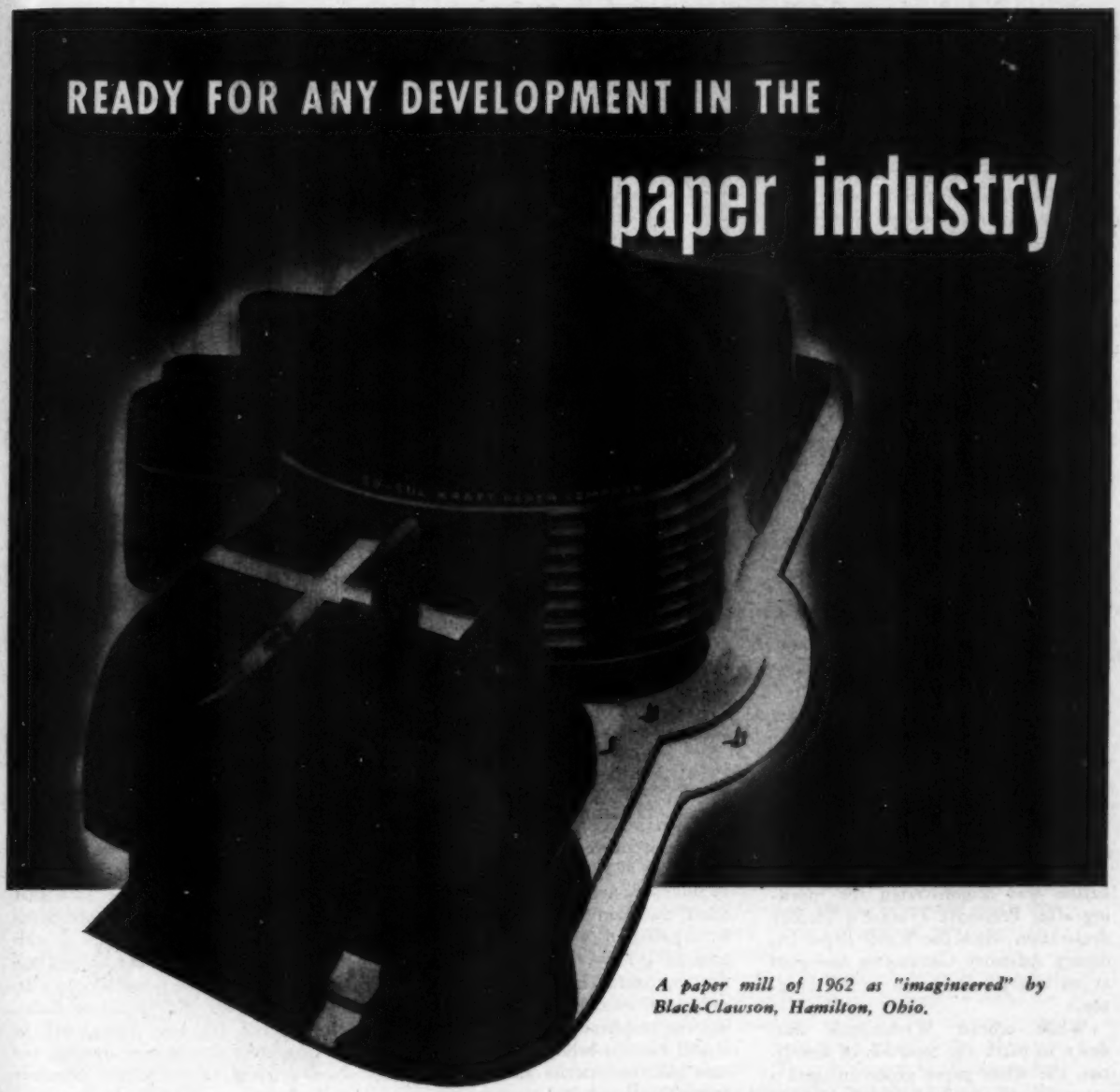
([2]) Represents arrivals during week of August 24, for which import entries were filed during week of August 31.

Source: Data supplied by the Bureau of the Census.

Cumulative Imports of Overseas Wood Pulp—V-E Day through August 31, 1945.

	Short tons	Value
Mechanically ground wood pulp, unbleached	3,045	$ 108,766
Sulphite, unbleached	49,861	3,144,269
Sulphate, unbleached (kraft pulp)	48,614	3,100,977
Sulphite, other than rayon and special chemical grades, bleached	8,351	629,491
Sulphite, rayon and special chemical grades, bleached	2,359	222,321
Sulphate, bleached	2,136	154,061
Total	114,366	$7,359,885

READY FOR ANY DEVELOPMENT IN THE paper industry



A paper mill of 1962 as "imagineered" by Black-Clawson, Hamilton, Ohio.

The fundamental principles of paper making—the chemistry of the process, if you please—may not change greatly in the post-war period, but it is certain that the mechanical technique of paper production is due for its most spectacular era of development.

Whatever form this may take however, wheels, shafts and gears still will be indispensable factors of machine design and operation. Speeds may be higher; radial, thrust and combined loads heavier; tolerances closer; and constant alignment of moving parts more imperative than ever; but Timken Tapered Roller Bearings are ready to meet all demands—as they have been throughout their 47 years of engineering development. Be sure the trade-mark "TIMKEN" appears on every tapered roller bearing that goes in your machines.

THE TIMKEN ROLLER BEARING COMPANY, CANTON 6, OHIO

TIMKEN TAPERED ROLLER BEARINGS

the position is becoming more difficult is that of the producers of the cheaper board grades. These mills rely mainly on waste paper and the collection of waste paper is declining month by month. The position has become so acute that another Government Waste Paper Salvage Campaign is under way.

The past two and a half months has definitely been a period of marking time. A position which has not been improved by the country being plunged into a general election and, for the most part of that period, being without an active government. The result of the election has produced something entirely new in British politics and consequently it is feared that business will mark time for a further period until it is able to sense which way things are going

◆

PULPWOOD AND WASTEPAPER CAMPAIGNS CONTINUING

The end of the war in no way eases the tight paper situation, according to Frank Block, director of the War Activities Committee of the Pulpwood Consuming Industries and the Conservation Committee of the Waste Paper Consuming Industries. Mr. Block also states that "both the U. S. Victory Pulpwood and the U. S. Victory Waste Paper Campaigns are continuing operations, at least for the present."

Seriousness of the paper supply situation was demonstrated the morning after President Truman's Victory declaration when the Waste Paper Industry Advisory Committee convened at an emergency session in Washington.

While official Washington shut down to mark the cessation of hostilities, the waste paper group mapped a campaign to continue operations until "industry and economic normalcy is restored."

Paper can very well become the chief bottleneck to orderly reconversion, the wastepaper committee was told bluntly by Benton R. Cancell, chief of the Forest Products Bureau of the War Production Board.

At the same time, Harold R. Boeschenstein, deputy chairman, WPB, warned the group that a continuing supply of paper and paperboard is essential to the national economy.

No improvement in the domestic production of pulpwood can be expected either in the immediate future or for some time to come, Mr. Block pointed out, unless there is a marked improvement in the manpower picture, and there is little likelihood of this taking place.

As a matter of fact, the manpower situation may become worse, he said, because of the reported return, according to the War Department, of nearly 18,000 prisoners of war. These prisoners, the Army has indicated, will all be repatriated within the next four months. They have been responsible for approximately 3,000,000 cords of pulpwood situation since the start of ing the woods at a time when demand is still months behind supply and current mill inventories are at a critical low. Some industry spokesmen have even expressed the fear that many mills will have to shut down, particularly in the South, if the prisoner exodus comes about.

Lack of sufficient manpower and transportation difficulties have been the two main factors in the critical pulpwood situation since the start of the war and no relief is indicated for probably another 12 months. Very few returned veterans can be expected in the woods for at least this period, and homeward bound war workers also are expected to be few for a long while. Railroad car shortages also will continue.

Other factors which tend to prevent any cheerful view of the current paper and paperboard situation despite the end of the war, include: a feared nationwide letdown in both pulpwood cutting and wastepaper salvage because the war appeal no longer exists; the tremendous backlog of unfilled civilian orders; continuing demand by the armed forces, and the fact that neither Canadian pulpwood nor Scandinavian pulp is coming in to this country at anywhere near the oft optimistically expressed predictions, Mr. Block declared. European countries, paperstarved for four years, will be making great demands on Sweden and Norway, and Great Britain certainly will depend upon Canada for huge amounts of paper supplies, he added.

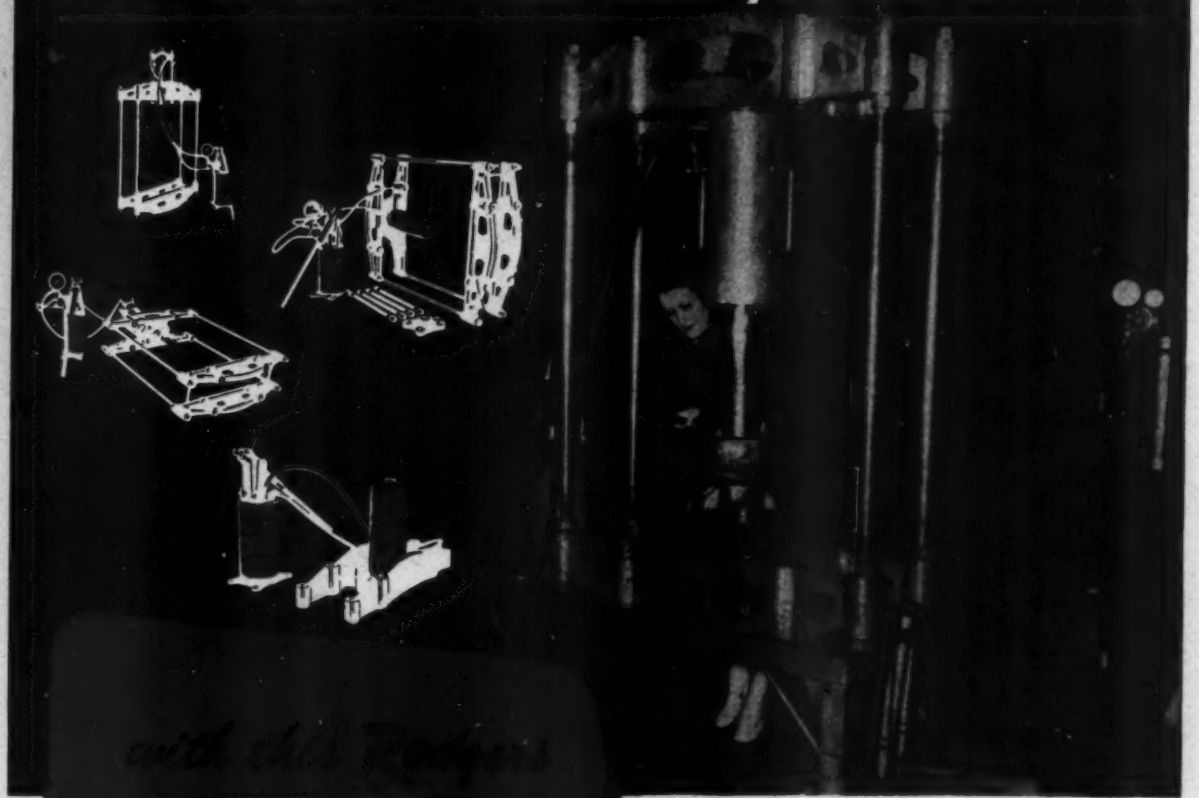
Mr. Block points out that end of the fighting in the Pacific may not necessarily mean an immediate paper-paperboard cutback by the armed forces. "Certain products like smokeless powder will no longer be needed, of course, but orders for other kinds of paper products may conceivably have to be stepped up. In other words, he said, while the Army and Navy may change specifications, their requirements may continue high. Our millions of troops are still overseas, and the government now faces the problem of taking care of a devastated Europe and a needy Far East, a problem that demands huge quantities of wrapping paper and shipping containers.

For these reasons, Mr. Block stated, letdowns in wastepaper salvage and

Holyoke Receives First Swedish Bleached Pulp

The first Swedish bleached pulp to reach Holyoke (Mass.) is being inspected as it is unpacked from a carload delivered at the plant of Whiting & Company. Unbleached pulp has been going into Holyoke for several weeks, but this is the first batch of bleached pulp. Shown here are: William L. Brodeur, superintendent; Charles Davidson, Jr., general manager; and Thomas Swiserski, of Whiting & Company. (See table of pulp imports, page 828.)

think of the time and labor you can save . . .



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The Rodgers Universal Press is the ideal answer for pulling gears, pinions and wheels: for pressing shafts, bushings and pins; for clamping and jacking operations. It is used on a stand as an ordinary press, or on its side horizontally. Tie rods are quickly disassembled to fit the press around a large piece of equipment and they may be lengthened with extension rods. Frame may be used in full or narrow width—cylinder is mounted either between upper frame members or suspended below. Tested special alloy steel assures great strength for safety and ruggedness. Power is supplied by either the Rodgers 4-speed Hand Pump or power-operated pump unit.

A Rodgers Universal will pay for itself over and over in the time and labor it will save you—we believe you will find it almost indispensable. *Write now* and let us send you all of the facts.

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pulpwood production at this time could create extremely chaotic conditions. "It is of the utmost importance, therefore, that wastepaper collections meet the 8,000,000-ton goal, and that pulpwood production meet its 16,000,000-cord goal for this year.

In this connection, Mr. Block pointed out that for the first six months of this year, total domestic receipts of pulpwood were 5 per cent behind the 1945 quota, and wastepaper receipts were 12 per cent behind this year's goal. In all regions, he declared, a precarious pulpwood and wastepaper situation continues.

◆

TOWN OF POWELL RIVER DEVELOPS HARBOR FOR MORE LOG STORAGE CAP.

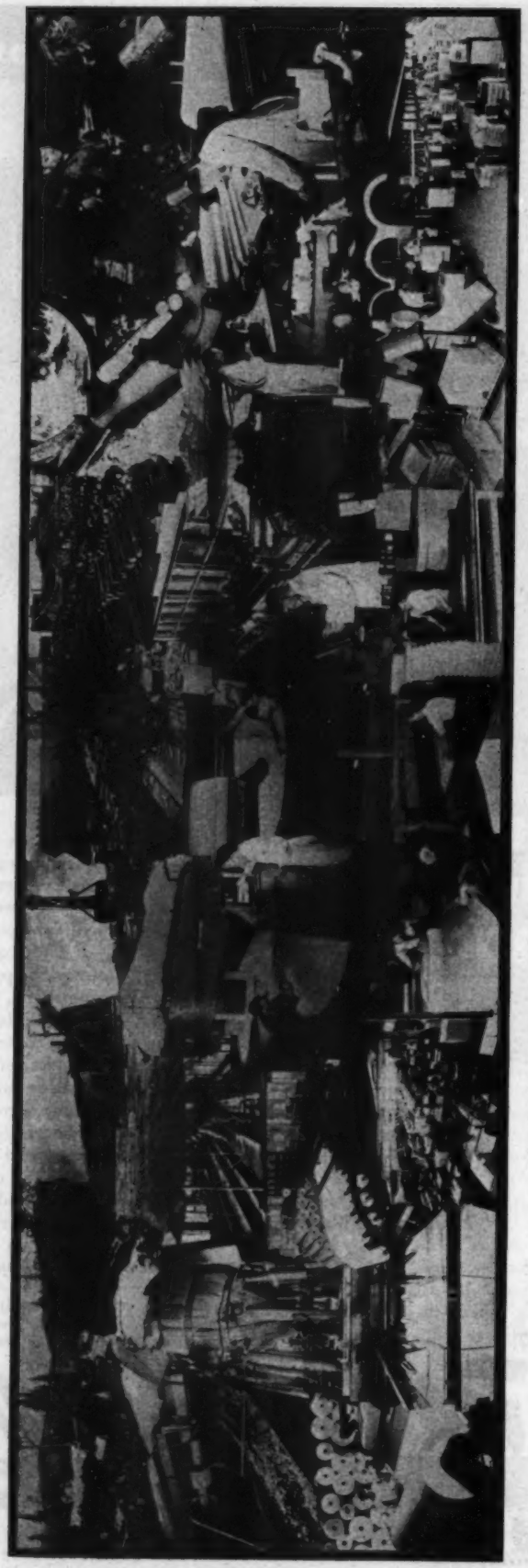
Harbor facilities are now being developed by Powell River, British Columbia, to give 50 per cent more log storage capacity. This is part of the expansion program of the Powell River Company. Installation of a hydraulic equipment for further utilization of wood is planned shortly. The barker plant will have special grading and mechanical distribution of logs in the millpond, including hydraulic barkers for large and small logs. In the project are nine sorting pockets for various species and grades, artificial current to carry logs through the sorting pockets, whole-log chipper, and reclamation of certain waterfront areas. Completion of these improvements will mean at least 10 per cent savings of wood per ton of product.

◆

RETIREMENT PLAN PUT INTO OPERATION BY PACIFIC MILLS, LTD.

Arrangements have now been completed by Pacific Mills Ltd., Ocean Falls (B. C.), for a retirement income plan for all permanent employees, and the plan went into effect on September 1. Speaking at a recent dinner meeting attended by key employees of the company, President Paul E. Cooper outlined the details of the retirement plan, which will embrace not only all permanent employees of Pacific Mills Ltd., but also permanent employees of subsidiary companies, Canadian Boxes Ltd., Vancouver, and Hudson Paper Company Ltd., Winnipeg, Manitoba.

The employee invests 3 per cent of his annual pay and the company subscribes an amount equal to 4 per cent of his annual pay. Any employee leaving the company or becoming deceased prior to retirement age, he or his heirs will receive all monies placed by him in the fund, plus interest.



Giant photo mural, in montage, traces thirty-seven steps in papermaking

This giant photo mural, tracing thirty-seven steps in the manufacture of paper from "tree to trade," was unveiled recently in Paper Hall, new executive offices of Reinhold-Gould, Inc., fine paper merchants in New York City.

Dramatically reaching 14 feet to the ceiling, the mural, credited to Drix Duryea, nationally famous artist and photographer, is 33 feet 4 inches long, and is represented as one of the largest murals decorating New York offices.

In its striking and interpretive result, this fine piece of work testifies to several months of painstaking creation and production activities by experts in the photo mural field. Further than that, the mural denotes authenticity of papermaking operations depicted, for it has been checked and double checked by outstanding papermakers, engineers, mill superintendents, and executives.

The modern montage pattern symbolizes the over-all architectural spirit of the Reinhold-Gould offices. The company's president, Harry E. Gould, emphasizes co-operative customer relations, and he indicates that the company's Service Department and Library already functions according to postwar plans. He believes that this will be the source of considerable assistance to Metropolitan graphic artists with creative problems.

Reinhold-Gould, Inc., are distributors for a long list of America's leading papermaking companies. The company's new offices are at 535 Fifth Avenue, New York City.

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TEXTBOOK SALES INCREASING

Members of the paper industry and others who desire to qualify themselves for participation therein are to be congratulated upon purchasing 580 copies of the Textbooks upon *The Manufacture of Pulp Paper* during the first half of 1944. This report from the McGraw-Hill Book Company shows the largest sales for a six-month period in several years. The plain inference is that with World War II more than half over and the outcome certain, people everywhere are getting themselves in shape for rapid progress when hostilities cease, while at the same time they are not slackening in doing everything they can to bring the conflict to an overwhelming conclusion.

Since the publication of the first edition of the Textbooks in 1921, a grand total of more than 38,000 volumes has been bought by pulp and paper mill executives, managers, operators and students. While the bulk of these items has been sold in North America, distribution has been worldwide because there is no comparable other publication in the field. The sales record at the end of June 30, 1945 is as follows:

		6 Months 1945	Total To Date
Vol.	I	57	5,280
"	II	75	4,495
"	III	167	11,477
"	IV	132	9,025
"	V	149	7,926
Total		580	38,203

Volumes I and II which deal with the elementary sciences requisite for the operation of pulp and papermaking equipment and processes are now no longer necessary because of the great advance in public education everywhere during the past twenty-five years. On the other hand, because of the recent great advances in scientific and technical fields, it is highly desirable that the volumes dealing directly with pulp and paper manufacture and the underlying theories thereof should be radically revised at the earliest opportunity, notwithstanding two preceding revisions since the original publication.

The Textbook Committee therefore has planned a new edition of four volumes under the general caption *Pulp and Paper Manufacture*, the individual volumes in the set to be entitled:

Vol. I. Wood Pulp
" II. Stock Preparation
" III. Papermaking
" IV. Auxiliary Equipment

An advisory comittee of prominent technical men in the United States and Canada under the chairmanship of W. G. MacNaughton, engineer of the News Print Service Bureau, has for some months been carefully examining and studying the present edition of the books page by page, paragraph by paragraph and sentence by sentence, to make certain that all previous errors are eliminated and that the best possible opinions and practices in the industry up to the minute are embodied in the next text. Altogether, it is probable that counting the authors of the many separate sections of the books and advisers in regard thereto, the work of not less than 100 of the best qualified men in the North American pulp and paper industry will contribute to this undertaking under the leadership of Editor J. N. Stephenson. Plans are being made to have the manuscript for the four new volumes in the hands of the editor not later than February 1946, in order that the printing may be completed and the books on sale early in 1947. It is expected to bring out the four volumes simultaneously if this is humanly possible.

The Joint Textbook Committee, two members of which have served since the original set-up in 1918, are:

Chairman, George E. Williamson, treasurer, Strathmore Paper Co.; R. S. Hatch, director of research, Pulp & Paper Div., Weyerhaeuser Timber Co.; Douglas Jones, secretary, Technical Section, Canadian Pulp and Paper Association; H. S. Spencer, mill manager, Howard Smith Paper Mills, Ltd.; R. S. Kellogg, secretary, News Print Service Bureau.

The committee receives standard royalties upon all sales of the books, which supply a sufficient and continuing fund for revisions whenever desirable. The undertaking is a self-sustaining one for the benefit of the industry everywhere.

◆

FINANCIAL

Securities prices forged upward during August as a result of the ending of the war with Japan and paper mill stocks followed the general trend. In all the markets, however, the bulge was most noticeable in the common or more speculative issues with prices of dividend paying preferred stocks and bonds more sluggish in following the upward trend. To what extent this may indicate an inflationary tendency and how much is due to expectation of higher prices for commodities is a matter for individual judgment, and opinions of market students vary widely.

American Writing Paper Corporation—Net profit for three months ending June 30 was $29,100, and for six months, $79,435 as against, respectively, $27,408 and $84,198 in the similar periods of 1944.

Brown Company—Net income for twenty-six weeks ending June 17 was $821,263 as against $778,792 for the corresponding period in the previous year.

The Celotex Corporation — Net profit for six months ending April 30, 1945 was $305,895. The company has issued $5,000,000 in 3¼% debentures, and 100,000 shares of 5% cumulative preferred stock at $20 per share, the proceeds to be used to redeem all outstanding 3¾% debentures, totaling $2,757,000, the balance to be added to the company's general funds.

Certain-teed Products Corporation —Net profit for six months ending June 30 was $421,634 as against $290,077 for the first half of 1944.

Champion Paper & Fibre Company —Net profit for the year ending April 30 was $1,803,864 as against $2,532,213 for the previous fiscal year. Its sales volume, however, was the largest in its history.

Container Corporation — Net income for quarter ending June 30 was $523,089 and for six months $1,002,134 as aganist, respectively, $625,626 and $1,195,143 for the comparable periods in 1944.

Continental-Diamond Fibre Company—Net income for three months ending June 30 was $112,411 and for six months $219,004, as against, respectively, $110,210 and $198,688 for comparable periods in 1944.

Crown Zellerbach Corporation—Net profit for the year ending April 30 was $7,093,085 as against $7,603,441 for the preceding fiscal year.

Crystal Tissue Company — Net profit for the first half year was $50,420 as against $47,900 a year ago.

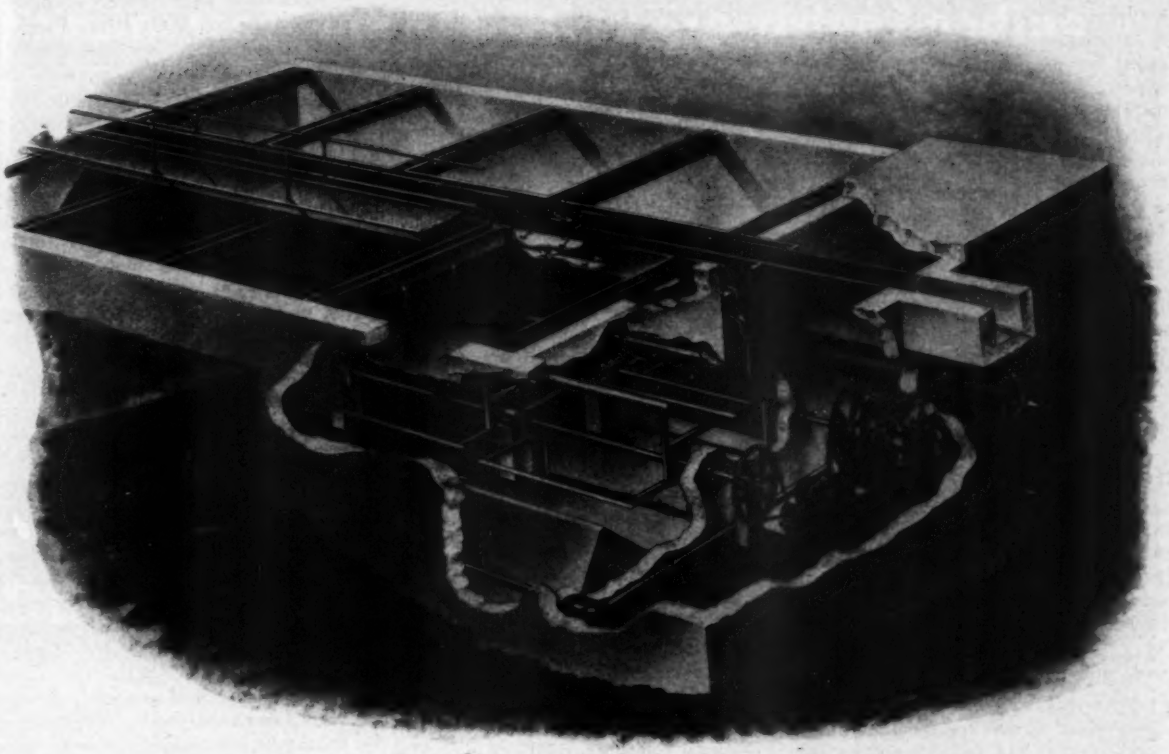
Eastern Corporation—Net profit for six months ending June 30 was $242,012 as against $250,918 for the first half of 1944.

Robert Gair Company, Inc.—Net income for three months ending June 30 was $187,285 and for six months to that date $383,116, as against, respectively, $196,729 and $330,319 for the comparable periods in 1944.

Great Northern Paper Company—Net income for three months ending June 30 was $367,496 and for six months $637,164 as compared with $493,443 and $941,869 for the comparable periods, respectively, in 1944.

Hinde & Dauch Paper Company—Net income for six months ending June 30 was $592,230 as against $608,587 for the same period in 1944.

Hummel-Ross Fibre Corporation—



If you have a water problem *(and you have!)* . . . here's your solution

Sure you have water problems—what pulp or paper mill hasn't? Permutit* equipment, like the Spaulding Precipitator shown above, solves many of them.

Permutit protects quality of products by removing the dirt, color, iron and other impurities from water supplies.

Permutit White Water Reclaimer recovers fibre and filler more completely than other types of equipment, permits re-use of water, reduces stream pollution.

Plan *now* to get complete control of water quality at your plant . . . regardless of local conditions. Write to: The Permutit Company, Dept. **15**, 330 W. 42nd St., New York 18, N. Y. or Permutit Co. of Canada, Ltd., Montreal.

*Trademark Reg. U. S. Pat. Off.

PERMUTIT

WATER CONDITIONING

Net profit for twenty-eight weeks ending July 14 was $101,778 as against $156,741 for the comparable period in 1944.

International Paper Company—Net profit for six months ending June 30 was $2,300,827 and for six months $4,411,071 as against, respectively, $1,824,567 and $3,941,273 for the comparable periods in 1944. The 1944 figures, however, do not reflect federal income tax adjustments made later, which would add $492,977 to net profit in the first half of 1944.

Kimberly-Clark Corporation—Net income for the quarter ending June 30 was $696,320 and for six months ending that date $1,398,493, as against $637,900 and $1,346,110 for the comparable periods in 1944, respectively.

Mead Corporation—Net profit for twelve weeks ending June 16 was $264,142, and for twenty-four weeks, $511,262 as against, respectively, $249,076 and $494,293 for the comparable periods in 1944. The company has made an $8,000,000 loan by a 3⅛% bond issue to refund $6,000,000 in 3¼% securities, the balance to be used for improvements.

Minnesota & Ontario Paper Company—Net income for the June quarter was $234,857 and for six months $529,296 as against $607,741 for the first half of 1944.

National Container Corporation—Net profit for three months ending June 30 was $328,948 and for six months $632,374 as against, respectively, $330,179 and $588,965 for the comparable periods in 1944.

Oxford Paper Company—Net income for six months ending June 30 was $444,915 as against $429,311 for the first half of 1944.

Puget Sound Pulp & Timber Company—Net profit for six months ending June 30 was $211,413 as against $243,322 for the first half of 1944.

Rayonier, Inc.—Net profit for the year ending April 30 was $1,839,126 as against $1,688,709 for the previous fiscal year.

St. Regis Paper Company—Consolidated net profit for six months ending June 30 was $1,452,758.

Scott Paper Company—Net profit for six months ending June 30 was $657,544 as against $645,747 for the first half of 1944.

Soundview Pulp Company—*Net* income for the first half of the current year was $415,694 as aganist $355,201 a year ago.

Sutherland Paper Company—Net income for three months ending June 30 was $136,712 and for six months $277,141, as against, respectively, $140,429 and $388,709 for corresponding periods in 1944.

Union Bag & Paper Corporation—Net income for the quarter ending June 30 was $508,663, and for six months $1,047,300 as against respectively, $372,118 and $795,354 for the comparable periods in 1944.

United Paperboard Company—Net profit for the year ending May 31 was $143,874.

New York Stock Exchange—Stocks

	Closing Prices August 27	July 25
A.P.W Products...	6½	5⅞
Celotex	18	16⅛
Same Preferred..	21¼	21
Certain-teed Prod...	12⅞	10
Same Preferred..	166	159
Champion P&F Co.	38	32½
Same Preferred..	...	*110¾-111
Container Corp.....	29¾	29
Cont. Diamond....	13⅜	12½
Crown Zellerbach..	25	22
Same Preferred..	102¾	103
Dixie Vortex	29⅛	*26⅞-27⅛
Same "A"	48	48¼
Robert Gair	6⅞	6¼
Same Preferred..	18⅛	17⅞
Gaylord Container..	27½	*25½-26¼
Same Preferred	*59-60½	*59-61
International Paper	28¾	25⅜
Same Preferred..	98	97½
Kimberly-Clark	49¾	45½
McAndrews & Forbes	*32⅞-33¼	33⅛
Masonite	44¼	42⅜
Mead Corp	17⅞	15⅛
Same Preferred	*102-103½	*104-105
National Container.	15½	15¼
Paraffine Cos.....	*67¼-70	65½
Same Preferred..	*109½-110½	110
Rayonier Inc.....	21	19⅛
Same Preferred..	37	36
Scott Paper	*55-65	51½
Same 4½% Pref.	111½-112	*108-112
Same 4% Pref...	112	111½
Sutherland Paper.	*34½-35½	*34-34¾
Union Bag & Paper	20⅜	16⅞
U. S. Gypsum.....	96½	89
Same Pref.	*190¼-192¾	*190¾-191¼
West Va. P&P Co..	30	28½
Same Preferred..	110½	*111-113

New York Stock Exchange—Bonds

Abitibi 5%.....	...	110½
Celotex 3¾%	...	...
Certain-teed 5½%.	...	...
Cham. P&FCo4¾%	...	...
Intl. Paper 5%....	...	104⅛
Same 6%.....	...	108½

New York Curb Exchange—Stocks

Am. Writing	8½	8½
Great Northern ...	...	39½
Hummel Ross.....	9	9
St. Regis	8	6⅞
Taggart	6⅜	...
United Wall Paper	6¼	5½

*Closing Bid and Asked Prices.

◆

▶▶▶ PERMITS have been issued to J. R. Booth, Ltd., of Ottawa, Ontario, for more than $600,000 worth of construction and new equipment, providing two new additions to the plant to cost $52,000 each and new equipment additions to cost $250,000 and $300,000.

WORK AT WOLF RIVER PLANT PROGRESSING

The Wolf River Paper Company, successor to the Wolf River Paper & Fiber Company in the operation of the mill at Shawano, Wisconsin, announces that it is proceeding satisfactorily in its program of repairs, replacements and improvements. Its schedule calls for an initial expenditure of about $250,000.00, for such purposes in order to complete plans to serve a market demanding higher grades of paper for more specialized use. Provisions have been made for the use of higher grades of raw material, and several new grades of paper have already been established.

The Great Lakes Paper Sales Corporation, with offices in Chicago and New York, continues as sole sales agent of the mill. John E. Gefaell, long identified with the newsprint, pulp and paper industries is president of both the operating and sales companies. Charles F. Naber, long identified with the Wolf River Paper & Fiber Company, is general manager and treasurer of the Wolf River Paper Company and George J. Cooper is secretary thereof. Walter A. Crawford, a paper mill engineer of many years experience and a recognized authority in the manufacture of paper specialties, is in charge of the new manufacturing program as assistant to the president.

◆

PILOT PLANT RESEARCH ON WOOD WASTE TO BE CONDUCTED IN WASHINGTON

In accordance with instructions from the American Forest Products Industries Hardwood Research Committee, equipment for a pilot plant for research into processes for converting hardwood wastes into fibrous products has been procured. Space for the pilot plant has been arranged at the Timber Engineering Company Laboratory, Washington, D. C.

Major equipment for the plant falls in three classifications: (1) disintegrating machinery includes a hammer mill, a disc grinder, and a pulp beater; (2) dewatering machinery includes a Feinic filter and a rotary screen; and (3) drying equipment.

Processes for producing paper, cardboard, and building board from hardwood wastes will be explored at the plant.

Those charged with carrying out the program are anxious to develop an American process, using American forest produce. The market is greatly influenced by an influx of foreign pulp.

Eliminates Hand and Other Expensive Loading

DROTT SKID-LOADER

Reach of 11½ feet makes it easy to load gondola cars.

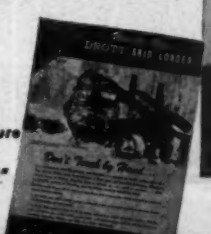
Skidding at mill yard — loads are skidded, never carried.

Eliminates hand labor from stump to destination! Drott Skid-Loader moves a cord of eight-foot pulpwood from pile to truck or sled in a fraction of usual time. On above operation, loaded eight cords of pulpwood in eighteen minutes with one helper. Truck-mounted jammer took six men and fifty-five minutes to load eight cords!

Money - saving, labor - saving Drott Skid-Loader also lifts, transports and loads logs, lumber, posts, poles, railroad ties, other forest products. Get all the facts . . . NOW!

★

Send For Descriptive Literature "Don't Touch By Hand" ***FREE***



Picks up pulpwood from pile on strip road, skids it to truck road, river or car — not touched by hand!

In elevated, discharging position; assumed on truck, dray or sleigh loading.

DROTT
EQUIPMENT

LONGVIEW FIBRE COMPANY HAS UNIQUE LOG POND

A novel log pond, which will expedite the handling of wood from nearby farm plots, has been installed by the Longview Fibre Company, Longview, Washington.

The pond, which actually is a water conveyor, consists of two channels, 50 ft. wide, each 350 ft. long and four feet deep. As soon as the 4-foot logs strike the water, they are moved toward the far end, where they make a bend and return the full length of the pond to an outgoing conveyor.

The water in the pond is made to move through the use of four 50-in adjustable pitch propellors, each powered by an electric motor of 25 hp. Circulation of approximately a quarter of a million gpm is possible, with facilities available for handling 200 cords of farm logs daily.

The company is arranging to obtain a large number of small suppliers, each of whom can be given an established annual log quota. There are many "stump" ranchers in the Longview area with woodland plots which can furnish a steady supply of logs suitable for pulp use.

◆

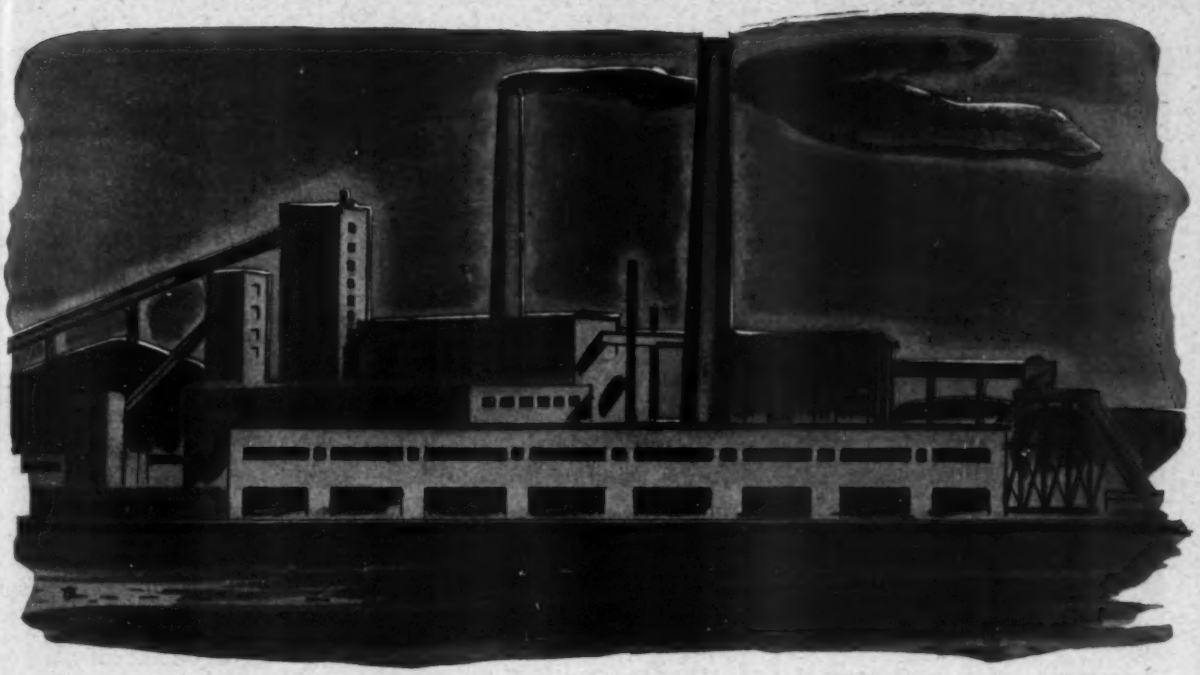
COLUMBIA UNIVERSITY TO TRAIN RETURNED SERVICE MEN TO START BUSINESSES

Columbia University announces that a short intensive course will be given to train returning service men and women who expect to start their own business, it is announced by Columbia University. The course is to be organized and sponsored by the School of Business and University Extension and offered on the campus at Morningside Heights. It will be a full-time course, running for eight weeks, October 27 to December 21.

The program is designed primarily for veterans who intend to operate small business and who have insufficient time for a regular college program. Two types of instruction will be emphasized: on the one hand, students will be given the essential business fundamentals in accounting, finance, marketing, organization, buying and inventory control, advertising, labor relations, booms and depressions, risk and insurance, taxation, planning and budgeting, and business policy. On the other hand, they will be given special instruction in the operations and problems of particular types of small business.

The unique features of the course are its method of instruction and the opportunities it will offer students to learn from those who know small busi-

The new log pond of Longview Fibre Company operates from farm wood lot to log pond to mill development. Illustrated here are stages in the handling of the logs. ABOVE (left)—A load of 8-ft. logs being delivered at the mill; (at right) the logs are being cut into 4-ft. lengths. BELOW (left) the 4-ft. longs are shown being dumped into the newly designed log pond in which moving water carries the short logs to a point where they are placed on the conveyor (shown at right, below) prior to being taken to the barker



WHAT GOES ON IN THIS PAPER MILL...

in addition to making paper?

Many paper mills today are *also* turning out chemical by-products of wood . . . such as tall oil, alcohol, resins, turpentine used in the manufacture of soaps, plastics, paints — to name a few. What new kinds of by-products will be made in paper mills of the future can't be said for sure right now.

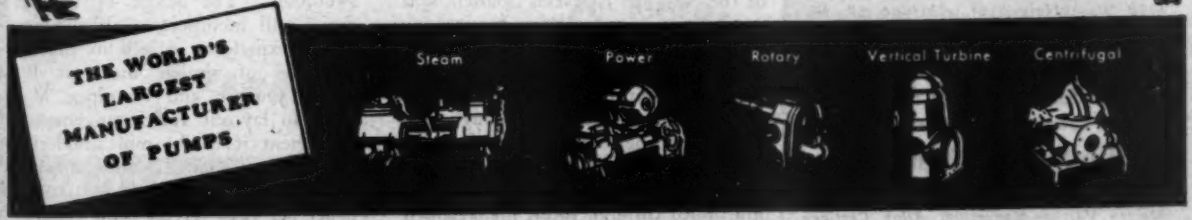
What *is* certain is that the processing of chemical by-products calls for the right pumps — often specially-developed pumps — such as Worthington builds now . . . and *will* engineer to solve your future problems.

Worthington P.A.E.'s* offer the most in experience and know-how of pump application for all types of pulp and process problems. Worthington offers all types and sizes of centrifugal pumps to *overcome* these corrosion, abrasion, heat viscosity and solidification problems. If you need the right pumps now . . . or will need them after the war, you'll learn that *there's more worth in Worthington* by phoning our nearest office or writing to— *Worthington Pump and Machinery Corporation, Centrifugal Pump Division, Harrison, N. J.*

*P.A.E.—Pump Application Engineer.

3 of 6 Worthington thin Black Liquor Pumps in the Diffuser House of the North Carolina Pulp Company, Plymouth, N. C.

WORTHINGTON



The Answer

to Valve Remote Control Problems

Hills-McCanna Diaphragm Valve with Westinghouse Flexair and Controlair Controls

Now you can have all the advantages of a Hills-McCanna valve . . . plus operation by air. It's the answer to many valve remote control problems. Westinghouse Flexair and/or Controlair Controls and an air actuated piston mounted on a Hills-McCanna Diaphragm Valve provide a reliable means of valve control from a central point.

If your need is for a simple open and close valve operation, a Hills-McCanna unit, equipped with a Flexair Control, may solve your problem. And where a throttling type valve is required, Controlair Controls and a Hills-McCanna Diaphragm Valve and Piston operation, will help meet your want.

Since all installations include an auxiliary air tank as part of the design, there's power to operate the valve even if the main air supply or all other power should fail.

And remember, Hills-McCanna Diaphragm Valves are absolutely leakproof, control the flow and keep unwanted material out of the line, won't clog or stick . . . have working parts isolated from the flow . . . and require no packing.

Write for the fact-packed blueprint. Available in sizes ranging from 4" to 12" inclusive.

Hills-McCanna Company
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HILLS-McCANNA
SAUNDERS PATENT
Diaphragm VALVES
Proportioning Pumps—Force-Feed Lubricators —Chemical Valves—Air & Water Valves— Marine Valves—Magnesium Alloy Castings

ness. The instruction will concentrate on only a few subjects at a time. To inform students of special types of small business, the classes will be supplemented by panel discussions. These panels will be led by men experienced in operating small business or by men who are specialists in serving small business.

The course is an attempt to do three things—to assist reconversion by helping veterans qualify themselves to open and operate small businesses; to reduce the heavy mortality and improve the effectiveness of small business, and to aid veterans in qualifying for a worthwhile career of benefit to themselves and to the community.

◆

▶▶▶ A FIFTH DIGESTER is being installed by Gaspesia Sulphite Company in its Chandler, Quebec, pulp mill, and it is expected the work will be completed by the end of the present year. The new digester will eliminate an unbalance in digester capacity as compared with the equipment capacity in the rest of the mill, and will result in an increase of 25 per cent in wood requirements.

◆

TIMBERLAND ACREAGE IS PURCHASED BY NOVA SCOTIA

The Province of Nova Scotia has embarked on a program of buying woodlands to insure stability of forest industries in the coming years. Already 250,000 acres of woodlands have been bought and it is expected that another 750,000 will be acquired in the next few years. The forestry department anticipates that within 20 years privately-owned lumber and pulp companies will be faced with a timber shortage, and Crown land stumpage will then be used to keep the lumber and pulp companies supplied.

◆

APPEAL FOR FOREST CONSERVATION IS MADE BY CAN. RESEARCH EXEC.

"Catastrophic effects" upon the economy of Canada would follow the disappearance or scarcity of forest supplies, Dr. C. J. Mackenzie, president of the National Research Council, said recently in an appeal for forest conservation released through the Canadian Forestry Association. "Fortunately, such conditions can easily be avoided," Dr. Mackenzie said, "though protection of the forests from fire and unnecessary destruction. Indeed the economic value of the forests can be multiplied through forest management and continual investigation and research. The industries based on the forest can develop more remunerative employment which makes for thriving communities."

◆

WOOD ROOM AT OREGON PULP AND PAPER CO. IS DESTROYED BY FIRE

The wood room of the Oregon Pulp and Paper Company's plant at Salem, Oregon, was destroyed by fire on August 19, with the digester building being badly damaged.

The main paper and bleaching plants, menaced early in the fire, were saved through the work of the local fire department and a detachment of soldiers from nearby Camp Adair. Two tank cars containing chlorine were moved from near the digester building by a train crew. Some supplies in freight cars also were destroyed.

It is believed the fire was caused by a welding torch or spontaneous combustion. The damage is estimated at $250,000. Reconstruction work has begun.

◆

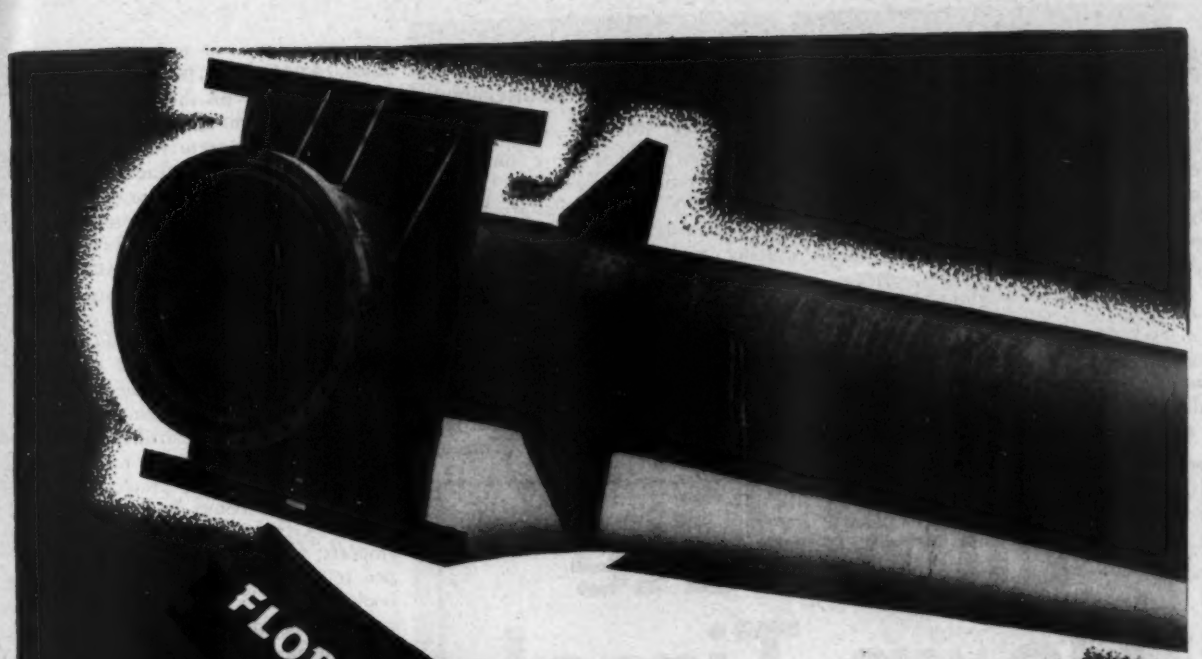
▶▶▶ SOMETHING NEW in school houses is a 30-seater classroom which can be loaded on a flatcar, floated on the rivers, or towed on winter sleds. It was built for Bowaters (Newfoundland) Company, of Corner Brook, Newfoundland, which is using it to spread the benefits of night school in its logging camps. The teacher at Camp 80, headquarters of this unusual night school, is Arthur Budgell, former patient at a T. B. sanatorium, who is now aided in the field of logging camp night school work by three other teachers.

◆

BUILDING PRODUCTS LTD. OPENS NEW ROOFING MILL

Timed to meet the increased demand for wide-scale home building, a new paper mill designed for the production of felt paper for asphalt roofing and siding products, was opened by Building Products Ltd. August 10, in Ville Lasalle, a suburb of Montreal.

The new mill occupies an area of 45,000 square feet and was built at an over-all cost of approximately $400,000. The design of this new paper mill incorporates all the company's experience gained in the construction of similar units at Pont Rouge, Quebec, and Winnipeg, Manitoba. In lay-out and arrangement of equipment it is the most modern of its type in Canada. In full operation, the mill will produce 12,000 tons of paper per year. At the same time, this



FLORI FABRICATION THAT "BREATHES"

HERE'S an example of our versatility: This huge part, for use in a 100-octane refinery, was entirely fabricated in our shop, including the superstructure and the plate steel flanges. To allow for the expansion and contraction of the pipe elbow due to temperature changes, the frame runs on 4 rollers to carry the movement. These rollers are equipped with machined pins and bearings.

Whether your specifications are intricate or simple—we can make it. Our experienced engineers, code-qualified welders, and master pipe-benders assure perfection from layout table to final test.

IF IT'S FABRICATION-CONTACT FLORI

FLORI

FABRICATION

THE FLORI PIPE COMPANY • ST. LOUIS 15 • CHICAGO 47

project will release the company's Pont Rouge mill for the exclusive manufacture of materials for B. P. Insul-Board and B. P. Insul-Bric Siding, boosting the production of these commodities and enabling the company to reduce its backlog of orders on hand, and put the company in a position more readily to supply the demand for these products.

Due to wartime conditions and the urgency for meeting the shortage of housing materials, there was no formal opening ceremony, and the first operations of this new unit were of a productive nature.

EFFECT OF RECIPROCAL TRADE WITH CANADA SHOWN BY IMPORT STATISTICS

Import statistics showing shipments of paper from Canada to the United States during 1944, now available in complete form, show the effect of the existing reciprocal trade agreement with Canada, according to Warren B. Bullock, manager fo the Import committee of the American Paper Industry.

A tabulation sent to the paper industry shows that in 1944 imports of printing paper from Canada alone totaled 26,000 tons. In 1938, the year before the duty on this paper was reduced 40 per cent under an agreement with Canada imports from Norway, Sweden, Finland and Canada totaled only 9,500 tons. Despite war time limitation on Canadian production, Canadian shipments increased from the 1938 total by a total of 18,500 tons, equivalent to loss of employment by American paper mill workers of over 55,000 working days. The duty rate on paper imported in 1944 was less than the difference in value between United States and Canadian currency, with the result that Canadian paper is sold in the United States market not only without any duty protection, but at an actual bonus over American prices. Of the 1944 printing paper imports, 8,000 tons were of paper valued at over 3 1/4 cents per pound, or book grades, as against a total of such paper imported in 1938 of 25 tons.

Canadian shipments of other grades of paper included 28,000 tons of pulpboard for use in the manufacture of wall board, 18,000 tons of paperboard, 8,000 tons of wrapping.

◆

▶▶▶ THE PROPERTY OF The San Giacomo Paper Company, Orange, New Jersey, has been purchased by the Cornwall Paper Mills, Inc., Cornwall, New York. It is reported that the new plant will manufacture 100 tons of paper daily.

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▶▶▶ A PERMIT has been granted the Sutherland Paper Company, Kalamazoo, Michigan, for the construction of a pulp and paper warehouse. Cost of the new structure is estimated at $65,000.

◆

▶▶▶ CONSTRUCTION OF an 80 by 100 ft. addition to house the printing room at its box plant has been started by the Pacific Paperboard Company, Longview, Washington. The cost of the construction is estimated at $16,000.

◆

CARNEGIE INSTITUTE TO HOLD EDUCATIONAL CONF. ON INSTRUMENTATION

An educational conference on instrumentation sponsored by the Carnegie Institute of Technology and The Instrument Society of America has been arranged for October 16-18, 1945.

The program will be divided into two parts. The first part covers the requirements expected by industries, and the second part will be devoted to present training in instrumentation.

Eliminate Down Time!

. . . ON SUPER CALENDERS, COATERS, AND IN ALL CONVERTING OPERATIONS

Down Time Means } Loss and Waste; Erratic Quality Control; Increased Cost Per Ton

YOU CAN'T AFFORD DOWN TIME IN POST-WAR COMPETITION

The Kohler System

of continuous unwinding and rewinding with full speed change of rolls

EliminatesDownTime!

The Kohler System Company

159 East Chicago Avenue

Chicago 11, Illinois

The chairman of the committee is Dr. B. R. Teare, Jr., head of the Department of Electrical Engineering of the Carnegie Institute of Technology, Pittsburgh. Due to traveling requirements, the conference is limited to fifty, and invitations will be sent to those in the order in which applications for attendance are received.

◆

CROWN-ZELLERBACH CORP. BUYS EIGHTH TREE FARM

The purchase of a 44,468-acre timber tract on the Molalla River near Portland (Ore.) has been announced by the Crown-Zellerbach Corporation.

The new purchase will be the company's eighth tree farm and will provide timber for its operations at Camas (Wash.) and West Linn (Ore.). The company now owns 420,000 acres of sustained yield tracts.

◆

JOHN STRANGE PAPER CO. ELECTS NEW OFFICERS

At a meeting of the board of directors of the John Strange Paper Company, Manasha, Wisconsin, held July 30, new officers and directors were elected to fill vacancies created by the death of Hugh M. Strange, president, and the resignations of certain directors whose stock interest in the Company has been transferred.

New officers of the organization are: John G. Strange, president; Joseph L. Gidwitz, vice president; Geeorge W. Hinton, treasurer; and J. H. Levandoski, secretary and assistant treasurer.

The John Strange Paper Company will continue to operate as it has in the past. Present personnel members will retain their respective responsibilities and the traditional standards and policies of the Company will be pursued.

The capital stock of the John Strange Paper Company is now distributed among several converters and the estate of Hugh H. Strange. Among the converters are the Menasha Woodenwear Corporation and the Wisconsin Container Corporation. No changes are contemplated in the current distribution policies of the Company and, inasmuch as the new stockholders will not by any means utilize the total production, it is anticipated that previous consumer relationships will be maintained both as a short- and long-range policy.

◆

▶▶▶ ALL PURCHASES of papermaking fibers used by Peter J. Schweitzer, Inc., New York City, are now in charge of George D. Burns. Mr. Burns also is in charge of all the company's flax operations in the Middle West.

24 PAGES pictorially presented, showing CLARK Fork Trucks and pallet methods in 32 different types of materials handling operations.
Contains illustrations and specifications of different pallet designs.
Yours for the asking—mail the coupon NOW!
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CLARK TRUCTRACTOR DIVISION
1028 JAMES STREET, BATTLE CREEK, MICHIGAN
I would like a copy of your book "CLARK BOOK ON PALLETS"
Name.....
Company.....
Address.....
City.....Zone....State.....

READ HOW "STREAMBARKER"

Can Save $42,519.

HERE ARE THE FIGURES:

Annual wood requirements (cords) - - -	55,800
Annual brooming loss (before eliminated by Streambarker)	3%
Annual brooming loss (cords) - - - -	1,674
Value per cord (delivered to mill) - - -	$25.40
Annual saving on brooming alone - - -	$42,519

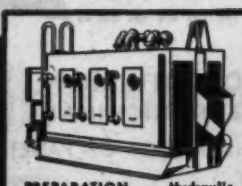
MILWAUKEE, WIS. — A comparison of *Streambarker* vs. drum barker operation by officials of 100 ton sulphite mill revealed possible savings of $42,519 in brooming alone, plus an unknown quantity in a better finished product.

Mill uses 100" rough wood costing $25.40 per cord. Requirement per ton pulp runs 1.8 cords; brooming loss, 3%.

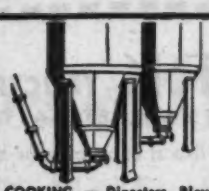
Officials concluded that pulp, under present methods, can never be as clean as with *Streambarker*. See your nearby A-C district office. ALLIS-CHALMERS, MILWAUKEE.

REVOLUTIONARY "STREAMBARKER" is Allis-Chalmers' answer for removing bark from pulpwood sticks — 4 to 8 feet long, and from 4 to 18 inches in diameter — by means of water under 650 to 800 lbs pressure.

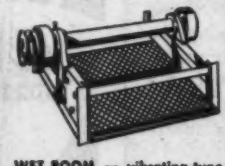
In a typical U. S. mill, an average of 14 cords of pulpwood per hour is being passed through new "Streambarker" — with *no* brooming; sticks barked *clean*, with *no* dirt, *no* surface rot! This Streambarker installation is operating 24 hours a day, and the 14 cord average is based on ninety, four-foot sticks per cord!



PREPARATION — Hydraulic Barkers, Chip Screens, Saws, Slashers, Interplane Grinders.



COOKING — Digesters, Blow Tanks, Kilns, Slakers, Heat Exchangers, Condensers.



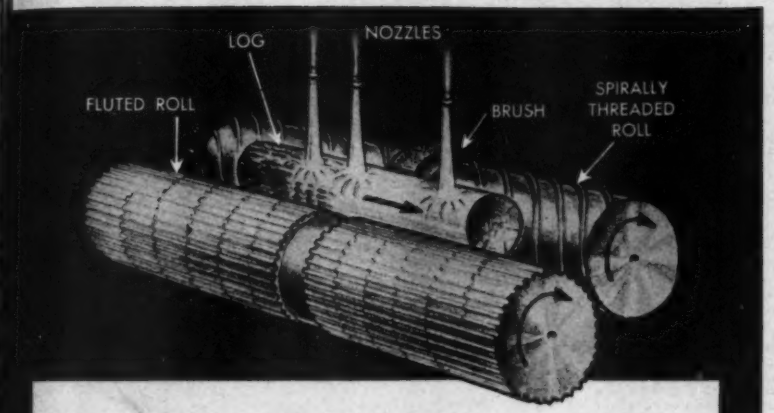
WET ROOM — vibrating-type screens for use as Thickeners, for dewatering rejects.

PAPER-MAKING — special design Drives for Paper Machines, Rewinders, Calenders.

ALLIS A-C CHALMERS

R" IN TYPICAL MILL

9...1st Year!



SECRET OF NEW A-C STREAMBARKER is *water* — delivered at 600 gpm through a high head, centrifugal 4-stage pump — and forced at 650 to 800 lbs pressure through 3 specially designed nozzles located directly over the axis of logs moving though barking chamber.

BARK IS REMOVED BY EROSIVE ACTION. Streams of water from the first 2 jets blast bark away from the log. Water from the third jet does final clean-up job.

TWO BED ROLLS, one fluted, the other spirally threaded — revolve and propel logs forward at a pre-determined rate. Roll speeds can be regulated by individual adjustable speed drives.

HERE'S WHAT "STREAMBARKER" CAN DO FOR YOU:

☛ **BIG PRODUCTION** — 8 to 14 cords per hour, depending on condition of bark, season, etc. Based on 90, four-foot sticks per cord.

☛ **LESS HANDLING** — Streambarker reduces or eliminates much work on slashing, rossing, knot drilling, hand cleaning — simplifies entire barking operation!

☛ **WOOD SAVINGS** — a 150 ton mill can figure to save up to $100,000 a year in brooming alone!

☛ **SPACE SAVINGS**—compact Streambarker saves valuable woodroom space!

☛ **LOWER COST** — initial and installation cost is less than for conventional barking equipment!

☛ **BETTER GRADE PULP** — you work with clean wood—free from dirt and surface rot!

☛ **LESS BARK MOISTURE** than with other barking methods. Thus, bark is more readily disposed of as fuel.

☛ **GREATER PROFITS** — it all adds up to lower costs, better pulp quality — and bigger profits for you!

A 1900

BULLETIN!

HOW TO TAKE A RECONVERSION INVENTORY of your Centrifugal Pumps, Motors, V-Belt Drives — is subject of A-C's newest help to U. S. industry!

Now being offered *free* to all interested individuals in the Pulp and Paper industry, is a *complete Reconversion Inventory Kit* consisting of — *fact sheets* and *check lists*, together with suggestions for inventory procedure.

SEND FOR THESE FREE HELPS TODAY!

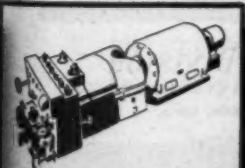
THE NEED. As equipment becomes more widely available, and as you reconvert toward peacetime production, you may be faced with an unprecedented problem of inventory-taking.

You may have to determine, *more quickly* than such a job has ever been done before, the EXACT CONDITION *of every piece of equipment* you propose to use in peacetime production.

For about 4 years, far greater emphasis has been placed on setting production records than on keeping maintenance records. Condition of equipment is often unknown. And because, during wartime, much equipment has been worked 3 and 4 times as many hours a year as in peacetime, even calendar age may mean nothing.

STANDARDS HAVE BEEN SET UP — which apply to *all* makes of equipment — not just A-C's. The Reconversion Kit offers you *standards* which will help you determine which of your units are: (1) okay as is; (2) need new parts; (3) will shortly require replacement; (4) need immediate replacement; (5) need reapplication; (6) are obsolete; or (7) may have parts of second-choice materials dictated by wartime shortages.

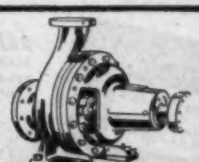
GET YOUR FREE KIT NOW! For your supply of Reconversion Inventory aids, covering Pumps, Motors and Drives, call your nearby A-C district office or distributor, or write direct to ALLIS-CHALMERS, MILWAUKEE.



POWER — all types of Power Generation, Distribution and Control Equipment.

MOTORS & CONTROLS — all types a-c and d-c Motors, ½ to 7000 hp — Gearmotors.

TEXROPE V-BELT DRIVES — fractional to 5000 hp — Constant and Adjustable speed.

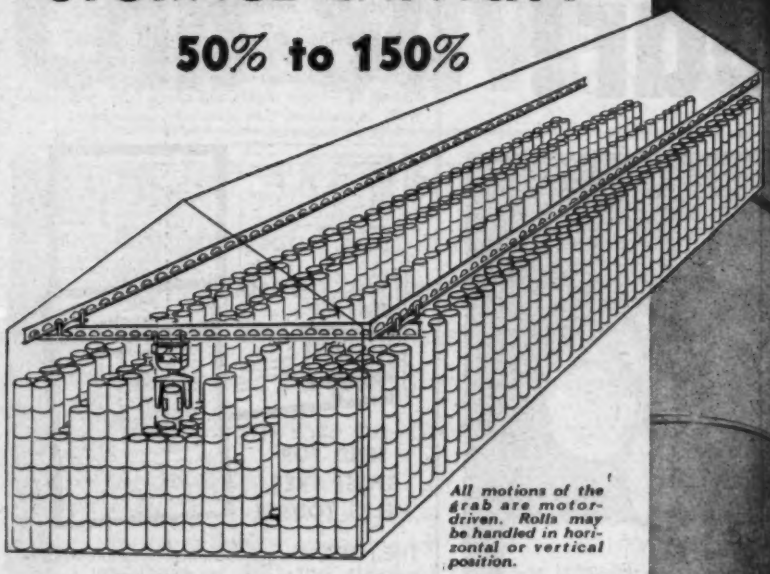


PUMPS — Single & Multi-Stage, 10 to 150,000 gpm — Paper Stock Pumps, Fan Pumps.

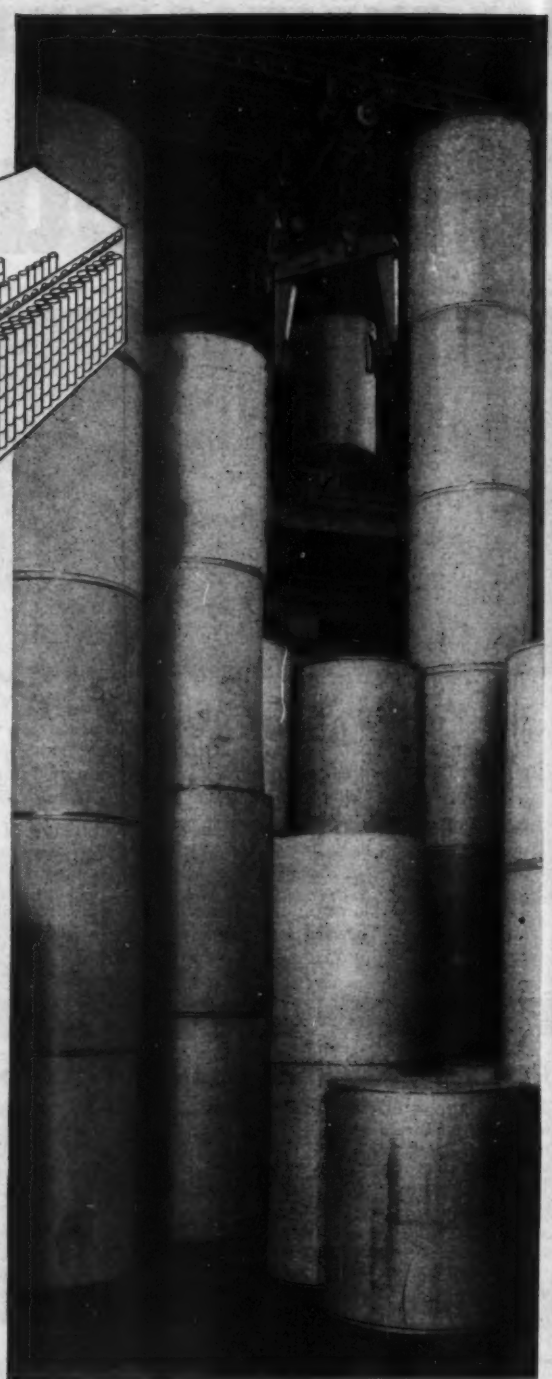
MILWAUKEE 1, WIS.

INCREASE ROLL STORAGE CAPACITY

50% to 150%



All motions of the grab are motor-driven. Rolls may be handled in horizontal or vertical position.



From 50% to 150% more rolls can be stored in a building that is of sufficient height to accommodate a Cleveland Tramrail overhead crane and motor-driven roll grab, because:

1. The entire floor area is utilized.
2. No aisle space for floor handling equipment is required.
3. Rolls are piled vertically 6 or 7 high (42 feet or more).

Rooms with many thousands of rolls can usually be served efficiently with only one man who handles all operations from the crane cab. Even where there are 50 or 100 different paper classifications, any type roll may be quickly stored or retrieved.

Reduction in paper spoilage is another of the many advantages of the Cleveland Tramrail method. In some plants this means a savings of 1% of all paper handled.

GET THIS BOOK!

BOOKLET No. 2008. Packed with valuable information. Profusely illustrated. Write for free copy.

CLEVELAND TRAMRAIL DIVISION
THE CLEVELAND CRANE & ENGINEERING CO.
1185 East 283rd St. Wickliffe, Ohio.

CLEVELAND TRAMRAIL
OVERHEAD MATERIALS HANDLING EQUIPMENT

The Regular "Extras" in RICHLAND TRIPLEX Dryer Felts

Eliminating the variables in dryer felt construction is one sure way of getting the most out of your dryer felt investment. In RICHLAND TRIPLEX, uniform weave provides the first precaution against variables—top grades of cotton provide another. The resulting uniformity of toughness, surface smoothness, high porosity and resistance to stretch and shrinkage assures the unvarying quality that makes for consistent economies when you specify these all-cotton dryer felts.

MT. VERNON WOODBERRY MILLS, INC.

TURNER HALSEY COMPANY

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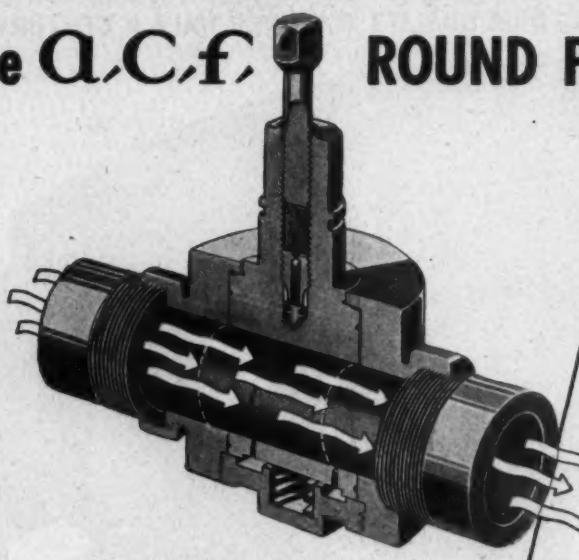
40 WORTH STREET • NEW YORK, N. Y.

CHICAGO · NEW ORLEANS · ATLANTA · BALTIMORE · BOSTON · LOS ANGELES · SAN FRANCISCO

Don't Let Valves Retard Your Pipe Line Flow!

Use A.C.F. ROUND PORT Valves (½" to 8")



SOLVES LADING PROBLEMS

Tar, sludge, grouting, asphalt, viscose, rayon, nylon, granular solids, paints and similar viscous or waste materials are all handled efficiently — as are paper pulp, pulp while in process, black liquor, white liquor, caustics, acids. Send for Catalog No. 3-P.

If your pipelines range from size ½" to 8", you should see that your valves do not impede free flow . . . an A.C.F. ROUND PORT Full Pipe-Area Lubricated Plug Valve can provide real help! When open, the valve becomes an exact continuation of the pipe — there is no change in lading velocity, area, direction or cross-section, thus reducing pumping and power costs. The A.C.F. ROUND PORT Valve has no crevices in which the lading may lodge or deposit.

In addition to full, unrestricted pipe area, A.C.F. ROUND PORT Valves, with Straight Through Plugs, provide the following noteworthy advantages:

- *Tightness against head leaks under any line pressure.*
- *Perfect lubrication against wear and abrasion.*
- *Least number of parts.*
- *No exposed seating surface.*
- *Quick opening.*
- *Installation in any position.*
- *Compactness for "close quarter" installations.*
- *Minimum corrosion.*
- *Ease of operation and dismantling.*

A.C.F. Lubricated Plug Valves will efficiently handle all processing and industrial plant ladings. Representatives in principal cities carry adequate warehouse stock for quick delivery.

AMERICAN CAR AND FOUNDRY COMPANY

Valve Department
30 Church Street, New York 8, N. Y.

TODAY

It's time to re-Cooper-ate

THE ONLY ALLOY FOUNDRY WITH ALL THESE FACILITIES

- Laboratory control over raw materials and finished products.
- Dual foundry . . . both hand and machine molding.
- Electric arc and high-frequency-induction melting furnaces.
- Centrifugally-cast castings.
- Heat treating of Castings up to six feet.
- X-ray and Gamma-ray inspection. Precision Castings.
- Zyglo detection of surface imperfections.
- Precision Castings.
- Machine shop . . . specially equipped for finishing stainless steel.
- Improved cleaning . . . including Lustracast electrolytic finishing which leaves all surfaces bright.
- Castings furnished rough, polished or fully machined . . . one ounce to two tons.
- Development of special alloys to meet unusual requirements.
- Technical consulting service.

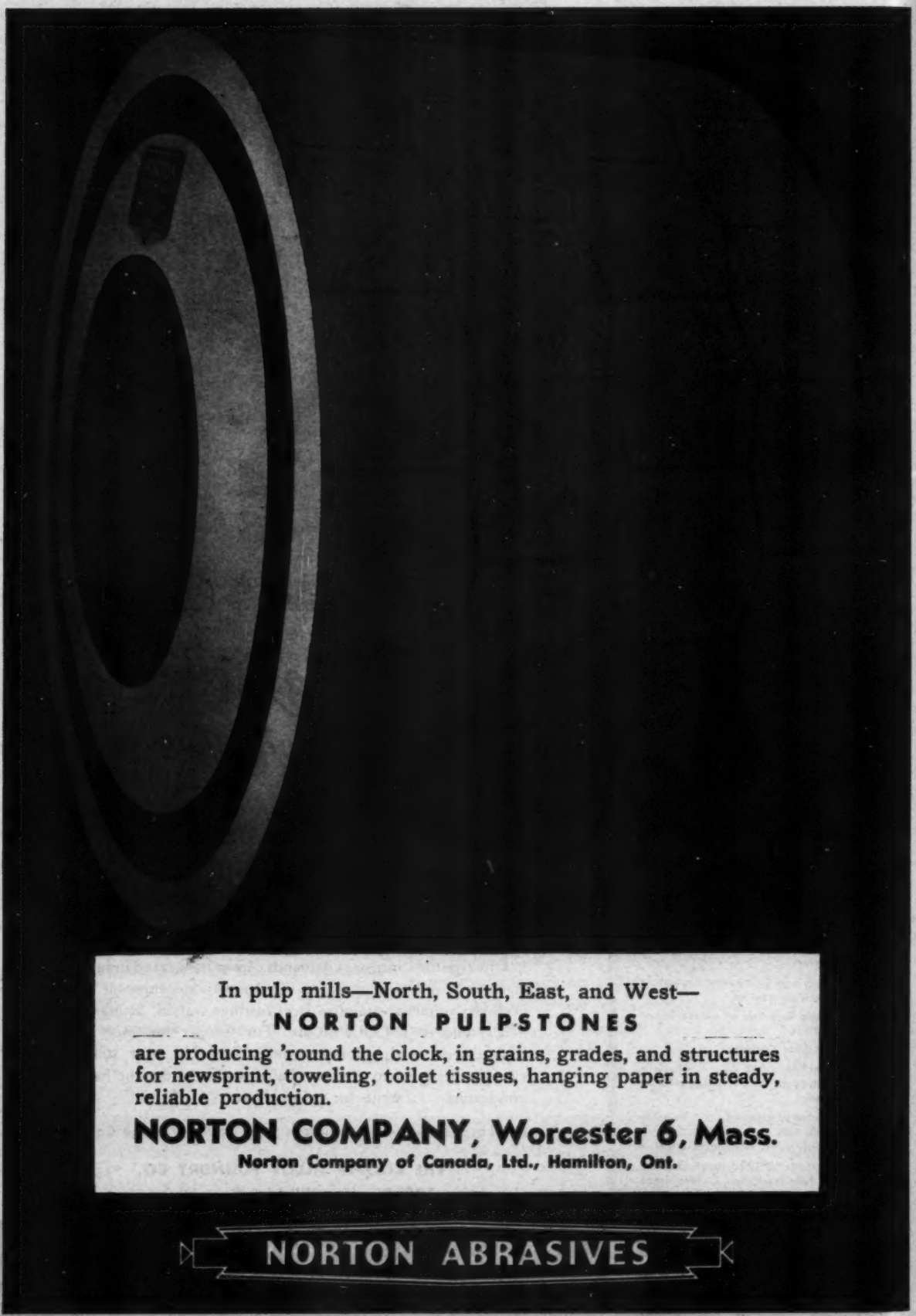
The rigorous, incessant demands of war have taxed industrial machinery and equipment to the utmost—so wherever parts need replacement—stainless steel castings, valves, fittings, etc. —it's time to re-COOPER-ate! For Cooper can meet your replacement needs promptly and effectively with stainless castings designed to give maximum service under the hardest conditions . . . write for information.

The Largest Exclusive Stainless Steel Foundry in the Country

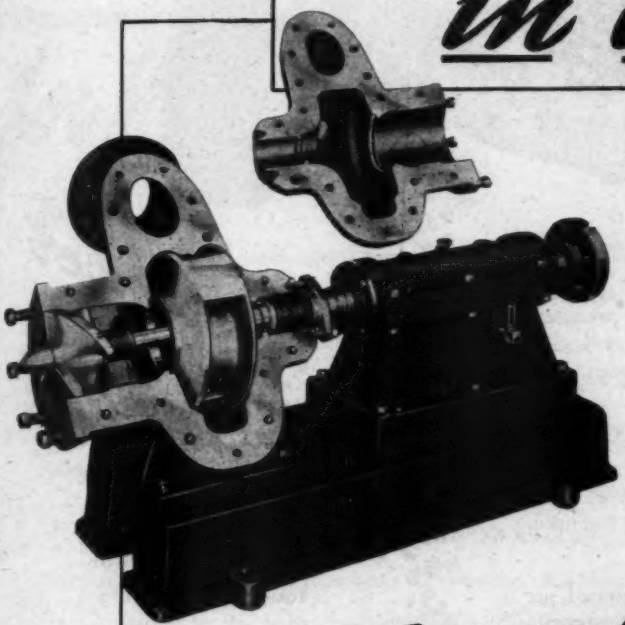
THE COOPER ALLOY FOUNDRY CO.
125 Bloy St., Hillside, New Jersey

THE COOPER ALLOY FOUNDRY CO.

STAINLESS • MONEL • NICKEL


In pulp mills—North, South, East, and West—
NORTON PULPSTONES
are producing 'round the clock, in grains, grades, and structures for newsprint, toweling, toilet tissues, hanging paper in steady, reliable production.
NORTON COMPANY, Worcester 6, Mass.
Norton Company of Canada, Ltd., Hamilton, Ont.
NORTON ABRASIVES

if you could watch the inside *in action*



YOU'D SEE WHY

"Buffalo" PUMPS HANDLE PAPER STOCK *so efficiently*

• The impeller is the heart of every paper stock pump—and Buffalo Pumps have *practical* ones. The specially designed impeller arrangement has wide openings to permit semi-solids and slugs to pass freely without clogging. Stock is thus allowed to flow slowly, with no more wedging or wear than would be encountered in flowing through a pipe. The overall construction is exceptionally sturdy, with heavy impeller, oversize bearings, and casing which can be opened without disturbing piping.

For performance that pays off in long term savings, specify Buffalo Paper Stock Pump. Full engineering details in Bulletin 953-F—yours on request.

BUFFALO PUMPS, INC.

213 Mortimer St. Buffalo, N. Y.
Canada Pumps, Ltd., *Kitchener, Ont.*

"Buffalo" PAPER STOCK PUMPS

DO YOU KNOW THESE FACTS ABOUT ARMOUR'S ANIMAL GLUE?

These Questions and Answers are of great importance to every manufacturer of paper!

Q. Is Armour's Animal Glue adaptable to my processes?

A. Yes, and *without complicated chemical additions!* Simply put the properly selected glue into solution with water and it's ready for use.

Q. Why is it particularly good for paper sizing?

A. It's chemically inactive on paper...there's no oxidizing, discoloring, flaking or shedding. It's grease-free . . . has the toughness, pliability, light color and clarity you need.

Q. Is it free from impurities?

A. Yes, every batch is clean, clear and one hundred per cent glue. This purity, plus the high jelly strength, viscosity, and tensile strength, gives you the better sizing you need.

Q. Is it uniform from batch to batch?

A. Yes, the careful scientific controls in making Armour's Animal Glue *guarantee* complete uniformity...help assure efficient, uninterrupted production in your plant.

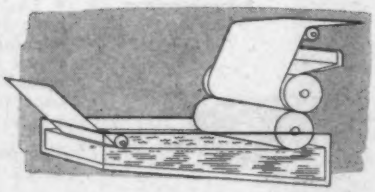
Q. Will it deteriorate?

A. No. Unlike some adhesives, Armour's Animal Glue loses no performance qualities in storage. It has a long life in solution—lasts for a day instead of just a few hours!

Remember

THESE VITAL FACTS ABOUT ARMOUR'S ANIMAL GLUE!

Chemically inactive
Pure, clean, clear
High jelly strength
Tough and pliable
Completely uniform
Easy to prepare
Easy to use
Does not deteriorate



ARMOUR GLUE DIVISION

Manufacturers of Hide Glue, Bone Glue, Flexible Glues, Soluble Dried Blood, Blood Albumin

1355 WEST 31ST STREET CHICAGO 7, ILLINOIS

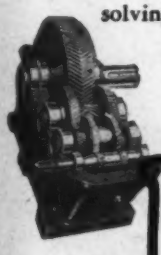
SIZE IT BEST WITH ARMOUR'S

JONES DRIVES
for the Paper Industry

★

You will find Jones Speed Reducers and transmission products on important drives in paper mills in every section of the country. For nearly a half century the Jones organization has been working with the manufacturers of paper making machinery and with engineers in the paper industry, on a wide variety of drive problems.

As a result of these years of experience, the Jones organization has collected a vast amount of technical data relating to drives in the paper industry. This information is available either in the form of catalogs or in our files. You are cordially invited to make use of any of this material, or our services, in any way you feel might be helpful in solving your drive problems.



W. A. JONES FOUNDRY & MACHINE CO.
4439 Roosevelt Road, Chicago 24, Illinois

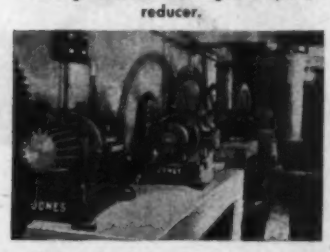
Jones

HERRINGBONE — WORM — SPUR — GEAR SPEED REDUCERS • PULLEYS • GEARS • V-BELT SHEAVES • ANTI-FRICTION PILLOW BLOCKS • FRICTION CLUTCHES • FLEXIBLE COUPLINGS

Jones herringbone speed reducer on a straw washer in a paper mill.

Wet end of sectional paper mill driven through a Jones herringbone speed reducer.

Vertical agitator in paper mill driven through a Jones herringbone speed reducer.



Group of agitator drives in a paper mill driven by Jones herringbone speed reducers.

Jones worm-helical speed reducer on a pulp tank drive.

Paper mill agitator driven with a Jones worm-helical speed reducer.

ONE *recognized standard*

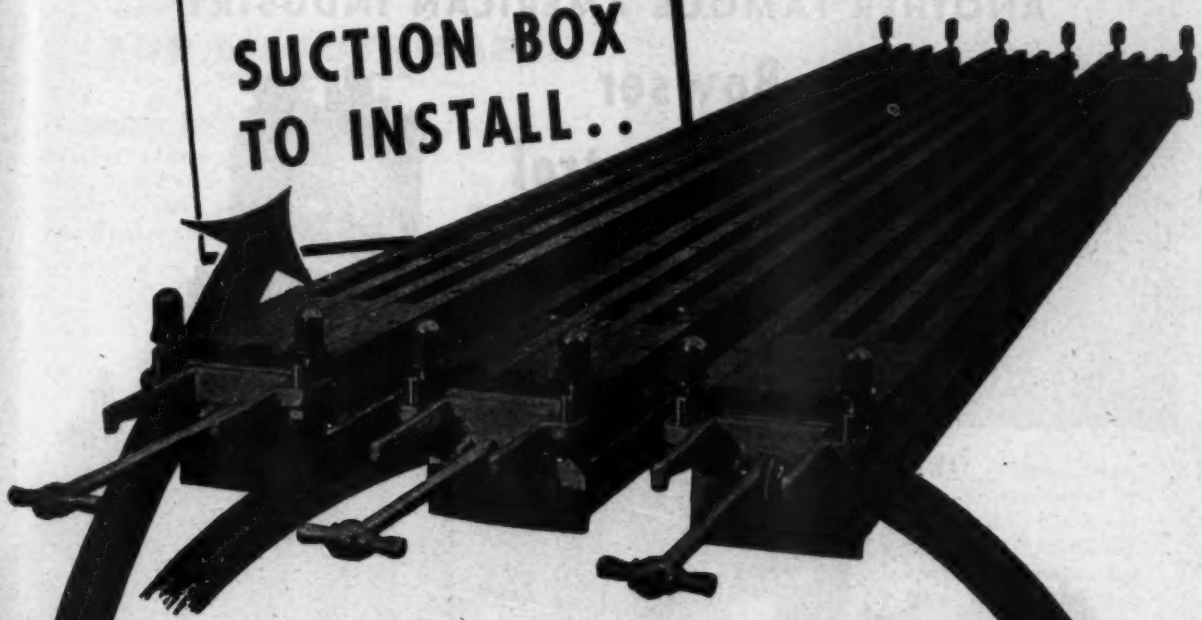
THE COTTRELL PROCESS OF ELECTRICAL PRECIPITATION

FOR GAS CLEANING, smoke abatement and removal of dust, fume, tar and other suspended matter from gas, there has been one universally accepted process for more than thirty years. In answer to your special problem, a Cottrell installation incorporating this rich experience in research, development and worldwide operation means the complete fulfillment of your requirements.

RESEARCH CORPORATION

NEW YORK 17: 405 LEXINGTON AVENUE
CHICAGO 3: 122 SO. MICHIGAN AVENUE

THE SUCTION BOX TO INSTALL..



Three big features commend the Black-Clawson suction box.

1. Faster Wire Changing because — lighter in weight.
2. Greater Cleanliness because — non-corrosive.
3. Truer surface — due to unusual truss construction.

Here is a "box" that can be installed on your present Fourdrinier, singly or in multiple units—and with little alteration, regardless of type Fourdrinier you are using. There are a great many B-C suction boxes of this type in operation and their success warrants your investigation. Have us explain further and quote for your present Fourdrinier.

THE BLACK-CLAWSON Co., Hamilton, Ohio

Shartle Dilts

Divisions: Shartle Bros. Machine Co., Middletown, Ohio; Dilts Machine Works, Fulton, N. Y.

Associate: Alexander Fleck Limited, Ottawa, Canada

ANOTHER FAMOUS AMERICAN INDUSTRY

That Uses Bowser EXACT Liquid Control

ON THE JOB... for more than 26,000 Hours! That's the Performance Record of BOWSER Filtering Equipment at the Famed **ANHEUSER-BUSCH BREWERY**

The Bowser Filter in the Anheuser-Busch Brewery in St. Louis pictured here has been operating day and night ... seven days a week ... for three full years ... a total of over *26,000 hours!*

This is typical of Bowser performance not only in the brewing industry but also in every other industry of importance throughout the Nation.

Two things you can count on ... the clarity of beer that's Bowser-filtered ... and the unfailing performance of Bowser Beer Filters and Bowser Meters. For years, Bowser Beer Meters have been approved by the U. S. Bureau of Internal Revenue for the measurement of taxable beer. In addition, more Bowser Beer Filters (diatomaceous silica type) are now in use in American breweries than all other makes of powder type filters.

BOWSER

SINCE 1885

In the paper industry, other types of Bowser Liquid Control equipment are performing equally well—and saving time, labor, equipment, money. Virtually all pulp and paper mills in the United States and Canada use Bowser Lubrication Systems for lubricating dryers, calender stacks, Jordans, hydrafiners and turbines.

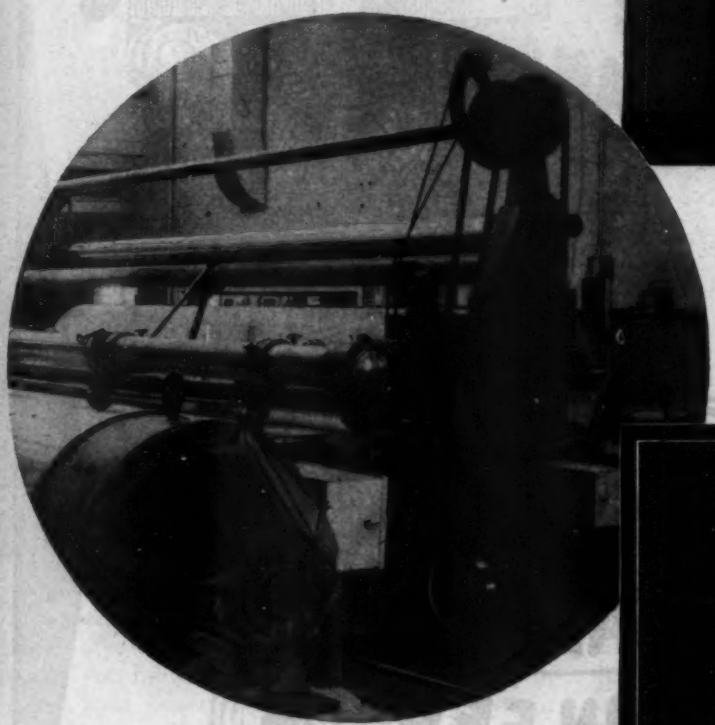
Smaller Bowser units, such as force-feed lubricators, oil filters for steam engines, flow indicating devices, etc. are also widely used. Let us give you details. BOWSER, INC., Dept. 16-I, Fort Wayne 2, Indiana.

Not only has Bowser's war production earned the Army-Navy E ... Bowser equipment has helped earn it for scores of other companies.

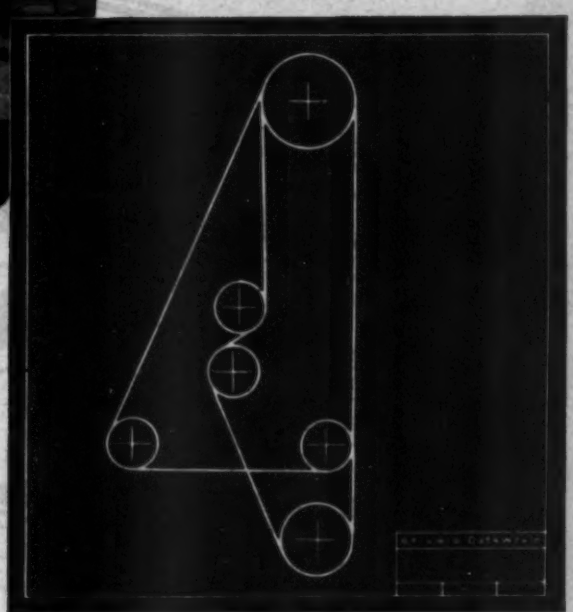
THE NAME THAT MEANS **EXACT CONTROL** OF LIQUIDS

IT TAKES *Smooth Power* FOR SMOOTH PAPER

① SMOOTH, POSITIVE POWER . . . power that doesn't hesitate . . . is a vital necessity in a paper mill. A slip . . . a fraction of a second pause in the flow of power . . . and a torn sheet may result . . . the coating of the paper may be uneven or rough.



② THERE'S A WAY to avoid those "power pauses." Power transmitted by Baldwin-Rex roller chain belts never slips . . . never falters. This finishing machine, for example, takes advantage of the positive grip of Baldwin-Rex chain on sprocket teeth to assure smooth power transmission.



③ LOOK AT THIS DRIVE DESIGN diagram. It shows how Baldwin-Rex transmits smooth-flowing power to the rolls. Baldwin-Rex chain belts are the ideal drive for the paper and pulp industry. They're highly shock absorbent, are not adversely affected by dust or grease, never slip and are equally efficient on long or short centers. Installation is simple.

For catalogs on Baldwin-Rex roller chain belts or competent information on your specific drive problems, write **BALDWIN-DUCKWORTH** *Division of* **CHAIN BELT COMPANY,** *367 Plainfield Street, Springfield 2, Mass., or call your local Baldwin-Rex representative.*

BALDWIN-REX *ROLLER CHAIN BELTS*

Baldwin-Duckworth Division, Springfield 2, Massachusetts • Rex Chain Belt and Transmission Division, Rex Conveyor and Process Equipment Division, Milwaukee 4, Wisconsin

Yes— APPLETON FELTS are truly AMERICAN

From the raising of the sheep that produce the wool from which Appleton Felts are made right on through to the last operation it's an American job producing Appleton Felts. They're made by Americans for American paper mills' use—today the standard in quality, uniformity and dependability.

APPLETON WOOLEN MILLS, *Appleton, Wis.*

THE TREND TO *Light-weight* STARTED HERE

REMEMBER your first experience with TITANOX pigments? Remember how you found in them the answer to many of your paper-making problems — how you attained whiter, brighter paper stocks with a minimum of pigment—and opacity such as you never before had achieved?

Then came the order to conserve. Lighter-weight stocks? Why not? TITANOX would give them the necessary opacity. So you came through with light-weight papers that have served well in the all-out effort to make the most of available raw materials.

You met a challenge and in doing so you started a trend — a trend toward new appreciation of the many advantages deriving from the use of light-weight papers. For, aside from the saving in raw materials, the train of economies set up by these thinner papers was considerable . . . lower shipping costs . . . less storage space . . . reduced mailing costs.

Thus light-weight papers were welcomed in many fields — to such an extent, indeed, that a demand for their continuance is evident even though the emergency has passed.

Our Technical Service Department will welcome the opportunity to help you in your post-war planning.

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SOLE SALES AGENT
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104 South Michigan Ave., Chicago 3, Ill.
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There's a WRIGHT WAY to handle materials

In handling materials, a lot of money can be wasted—or saved. The **WRIGHT** way *saves*.

In the Wright line there is a hoist for every job. Wright Improved High Speed Hoist, Wright Screw Hoist, Wright Differential Hoist, Wright Speedway Electric, Wright Trolleys, Wright Jib and Traveling Cranes—every one of them designed and built to do your specific job, safely, rapidly, economically. Safety is the *first* in-built quality of any machine that bears the name **WRIGHT**. They are designed for speed and efficiency; built for rugged durability.

See your **WRIGHT** distributor. You'll find him listed in your metropolitan classified telephone book. If your problem is special, ask your distributor to call a **WRIGHT** engineer, who has had years of experience in solving material-handling problems.

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FLYING OVER THE WRIGHT HOIST PLANT

ACCO

York, Pa., Chicago, Denver, Los Angeles, San Francisco, Portland, New York, Bridgeport, Conn.

WRIGHT MANUFACTURING DIVISION
AMERICAN CHAIN & CABLE

TRADE MARK

In Business for Your Safety

17 Units of 36, Comprising Over Two Miles of Acid Cooling Coils 3¼" O.D. x ⅜" Wall S.S. Type-347

STAINLESS

Single Order for 2 Pcs. 8" 180° Stainless Steel Return Bends Wall Thickness ½" S.S. Type-347

. . . A Single Fitting or Miles of Prefabricated Assemblies

. . . we can fill your requirements

THE manufacture of Stainless Steel Welding Fittings and Tubing is our specialized business. Whether your requirements call for a single fitting or prefabricated assemblies involving literally miles of pipe or tubing and fittings, we can meet your specifications.

Welding Fittings include 45° and 90° Elbows, 180° Return Bends, Reducers, Tees, Caps, and Lap-joint Nipples.

I.P.S. sizes range from ⅛" to 10"; tube sizes from 1" to 24". Available in Stainless Types Nos. 304, 316, 321, 347; also furnished in other analyses.

Fittings are annealed, blasted, and passivated for best corrosion resistance. The ends are accurately machine cut and beveled to 37½° with approximately 1/16" straight face. The radius of each Elbow is 1½ times the nominal pipe diameter.

We are also equipped to fill your Stainless Steel Pipe and Tubing requirements in various alloys and in sizes ranging from 4" O.D. to 24" O.D. . . . wall thickness 7/64" to ½" and in any desired lengths.

We have complete facilities for bending, welding, machining, annealing, blasting, and testing, plus experienced personnel to perform these operations, an all important factor considering the relatively high cost of raw materials. You are thus assured of the finest in Stainless Steel Piping.

Send us your specific requirements. Complete information will be given promptly without obligation.

★ Buy More War Bonds ★

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Pittsburgh Piping

AND EQUIPMENT COMPANY

10 Forty-Third Street — Pittsburgh, Penna.

The Contents is TISSUE-
the Container is BOARD-
the Felts are HAMILTON-

The techniques of paper manufacturing vary from mill to mill. The problem of removing water from the fibers is common to them all. Its solution is always to be found in the use of the correct Hamilton Felt. » » There are Hamilton Felts especially built for manufacturing container board, — other Hamilton Felts for the fabrication of light weight fine papers. There are Hamilton Felts for use on cylinder machines and others for fourdriniers. » » Tell us what kind of machines you use and what character of finished product you want to produce. We will provide Hamilton Felts that will remove more water at the couch, stand the gaff of higher speeds and greater pressure, improve the formation of your sheets, reduce broke and greatly lessen the amount of steam required at the drier rolls. » » A big contract? Certainly. But it is based upon the experience of generations and backed up by the performance of Hamilton Felts in the most efficient paper mills of the world.

• From the thinnest tissue to the heaviest board there is a Hamilton Felt that will do your work better, faster and at lower cost.

SHULER & BENNINGHOFEN, HAMILTON, OHIO

•
Miami Woolen Mills
•

Hamilton Felts

•
Established 1858
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Faulty Drying LIMITS PAPER PRODUCTION

ARMSTRONG TRAPS ELIMINATE *Faulty Drying!*

Features of Armstrong Traps

1. Condensate discharged as fast as it accumulates.
2. Automatic air elimination.
3. Long life parts — chrome steel valve and seat, hardened, ground and lapped. 18-8 stainless bucket assembly.
4. Low maintenance.
5. Choice of body styles: with side-inlet and side-outlet pipe connections, or bottom-inlet top-outlet.
6. Traps for paper machines specially designed for that service. NOT the same traps used for other purposes.

EFFICIENT DRYING is one of the most important considerations in the production of paper and efficient dryer drainage is one of the most important considerations in efficient drying. To secure maximum production plus *uniformity* of drying, dryer temperatures must be maximum and uniform throughout the machine. If dryer temperatures in the main drying section are appreciably below maximum steam temperature, faulty drainage is indicated. For example, if steam pressure is 10 psi., temperature inside the dryer should be approximately 240° F. Lower temperatures indicate the presence of condensate and air.

Armstrong Inverted Bucket Traps built especially for dryer drainage automatically discharge both air and condensate as fast as it accumulates, assuring you of maximum dryer temperatures.

For complete information, write today. For an educational discussion of the subject, ask for "OBSERVATIONS ON DRYER DRAINAGE" by Paul L. Ulrich.

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Slime Chaser

In a one-ounce sealed envelope. Throw it in the beater unopened

Cleans Pipes
Kills Bacteria
Reduces Washups
Fewer Slime Rejects

R. T. VANDERBILT CO., INC.
230 Park Avenue, New York City

Editorial

The War Is Over!

▶▶▶ THE GREATEST WAR of all time has become history. Since the Germans and the Japs have been overpowered and have surrendered unconditionally, the business barometer indicates a very favorable return to peacetime activities. The croaking pessimistic predictions of hysterical revisionists have not materialized. Business is going ahead on an even keel. No panic. No distress anywhere visible.

Business on the whole throughout the country is much better than anticipated. The only hindrances visible now to complete business revision are the hangover governmental controls, particularly, the price controls of OPA. There is not a scintilla of excuse for a continuance of the war emergency OPA controls. They were purely war emergency measures, but now that the war emergency is over, these controls should be speedily abolished. In the paper industry, they are primarily abhorent. Any prolonged continuance is simply going to operate as a barrier to full and complete resumption of business.

In the first place, paper is the natural concomitant to all industrial expansion processing and progress. Without a plentiful continuously increasing supply of paper, it will be impossible to sustain the employment of 60,000,000 employees. All such activity on such a large scale demands a plentitude of paper for its initiation and maintenance.

The continuance of OPA ceilings on the adamant, arbitrary basis as of the present, means that mills will refuse to make those low-priced grades like wrapping and shipping requirements which bulk so large a total of the business economy. Without them, of what use is it to produce commodities which cannot be shipped into markets and distribution channels?

This situation, which we are right now facing, will constitute a bar to full reconversion operations.

The paper mills, one and all, are prepared and desire to co-operate 100 per cent with the revision program. They can do just as good a job for the winning of the peace as they did for winning the war.

However, they are at present debarred from that 100 per cent cooperation in the revision program because of the maintenance of senseless ceilings on paper.

Already the industry has suffered a setback because the OPA by its ewe-necked adherence to its ruling refused to grant a small increase in price to the Swedish pulp, which was all ready to be shipped to this country. An increase in price of $5.00 a ton would have brought from 500,000 to 600,000 tons of badly needed pulp to this country, every pound of which would have aided our civilian business to get going at once, relieved the strain upon our own overworked domestic equipment, and lessened the pull upon our depleted domestic timber areas to the extent of a million cords of pulpwood. The result is a capital loss which the industry cannot make up—all due to an adherence to an academic formula which ignores practical advantage.

With WPB controls over the delivery and use of wood pulp slated for removal on September 30, the industry is in position, except for OPA regulations, to go ahead and accomplish its reconversion.

Yes, the War is over!

Creative Thinking

▶▶▶ IN SPEAKING BEFORE the annual conference of the American Welding Society a few weeks ago in Cleveland, Ohio, Dr. Howard E. Fritz, director of research of The B. F. Goodrich Company, said that "if we are to sustain our standard of civilization, we must give all possible impetus and encouragement to creative thinkers." He further declared that "there is no such thing as mass production of creating thinking," but that such thinking comes from inspiration, "which is and can only be the product of free men."

These comments are fundamental to good living. Yet, they prompt the questions—What is creative thinking? Who are creative thinkers? and What prompts or activates creative thinking?

In the field of pulp and paper, for example, could it be said that creative thinking is thinking beyond the individual job, and that creative thinkers are such individuals as do think in this manner? If such a concept is acceptable, there would be no employee of normal mental attributes in the industry incapable of doing creative thinking—from the president, the research director, the manager, the superintendent down to the employee filling the most menial job. Yet how few employees are commonly credited with doing more than an honest day's work—doing the work of the individual job—doing it well, but nothing more.

Perhaps that matter of inspiration, mentioned by Dr. Fritz, is lacking or is stymied in many organizations.

Although inspiration may be an innate quality of an employee, it can be neutralized or stifled through lack of consideration on the part of the boss or of the employer. In other words, the incentive to contribute to the progressive development of a company is insufficient to put the "old thinking cap" to work.

If creative thinking is desired by industry, and, specifically by a pulp and paper mill organization, make the incentive right and such thinking will be forthcoming.

Current Thought

WILLIAM SIBLEY

The Impending Transportation War

▶▶▶ THE POOR, old railroads—backbone of our national growth and spinal cord of our development—seem to be in for a drubbing. But don't sell your railroad stock short, at least for quite a while.

Driving the golden spike in Colorado, which gave the nation a transcontinental railroad, was the spike that nailed the old stage coach to the cross of oblivion. From the days of Gould, Hill, and Harriman, the railroads have, single-handedly, opened the vast reaches of the continent, and made possible the development of the most powerful nation on earth.

But lately the railroads have been having their troubles—and more trouble seems to be in sight. A few years ago, the perfection of the automobile subtracted millions of pay passengers from the potential revenue of the railroads. Then came the motor trucks which performed a similar job of subtraction in their freight revenue. Today the railroads can look forward to still further, and even mightier, subtraction from both divisions—by airplanes.

Already the air lines are carrying annually four million passengers which would otherwise be first-class patrons of the railroads. According to L. Welch Pogue, chairman of the Civil Aeronautics Board, the next generation may well see the development of air transportation to the point where it will be carrying "20, 40, 60 million passengers a year, and when the carriage of air cargo will be measured in hundreds of millions—if not in billions—of ton-miles."

But you may inquire, what about costs? Neither individuals nor corporations can spend too much for mere speed. . . . The answer to that logical query is: the cost differential is already to be ironed out—and fast!" Just a couple of months ago *Aviation News* completed a survey of air travel fares versus rail-Pullman fares. This survey of current traffic schedules revealed a surprising similarity between air rates and first-class rail fares. Out of 50 flights, chosen at random, 23 trips actually might be taken cheaper by air than by rail-Pullman. The difference in many of them was slight, of course; the average reduction in fare cost for the 23 trips being $1.50. But when one considers the free meals served aloft and the free berth (in the event of night travel), plus the marked difference in travel time, it would seem that the air folks have the real edge. Of the 27 trips whereon the air fares were greater than rail-Pullman fares, the average differential was only $3.61!

The accompanying tabulation of the fifty trips analyzed will give you an idea of the comparative rates.

It should be kept in mind that these are the rates of today, not tomorrow. Both air and rail fares are now subject to 15 per cent federal tax. Today the average air fare is 5 cents a mile. However, T. P. Wright predicted that within the next ten years this average fare will be down to 3 cents. Authorities also predict that within the same decade we will witness increases in airplane speeds to an average of 300 mph.

The Interstate Commerce Commission is even more sanguine regarding the development of air travel than the Civil Commission. It believes that reduction to 1 to 1½ cents per trunk-line mile is an easy possibility for the next ten years. Furthermore, the ICC expects the air lines to offer second-class service (and rates) but, unlike the railroads, not on the same plane.

Postwar plans already made by the railroads, (the which comprehends pronounced improvement in passenger equipment and the retirement of the old, and now obsolete, cars) brings them near the peak of their foreseeable quality in appeal, service and design. Contrawise, the present day quality of airline performance and accommodation seem to be in their beginning. There are many engineering and airport-facility problems to iron out, but that these problems will be solved, no one doubts—even the most reactionary and conservative of railroad presidents.

To add to the headaches of the railroads—here comes the ARBA (American Road Builders' Association) program for vast improvements and extensions to our existing system of highways. Arterial, high-speed highways are planned at the rate of some 5 billion dollars a year for the next five years. Even fractional performance of that plan will put millions of vastly improved automobiles on the highways—carrying more millions in the opposite direction of the railways ticket office. The air-conditioned automobile which uses far less gas and possesses greatly improved tires (not to be here as early as tomorrow, but certain to come within ten years) will shatter fleet-owner's figures of 5 cents a mile for over-all auto travel cost (interest, amortization, insurance, upkeep, gas and oil), probably bringing that figure to the neighborhood of 3 cents—mighty cheap, and comfortable, travel when more than two passengers ride the automobile.

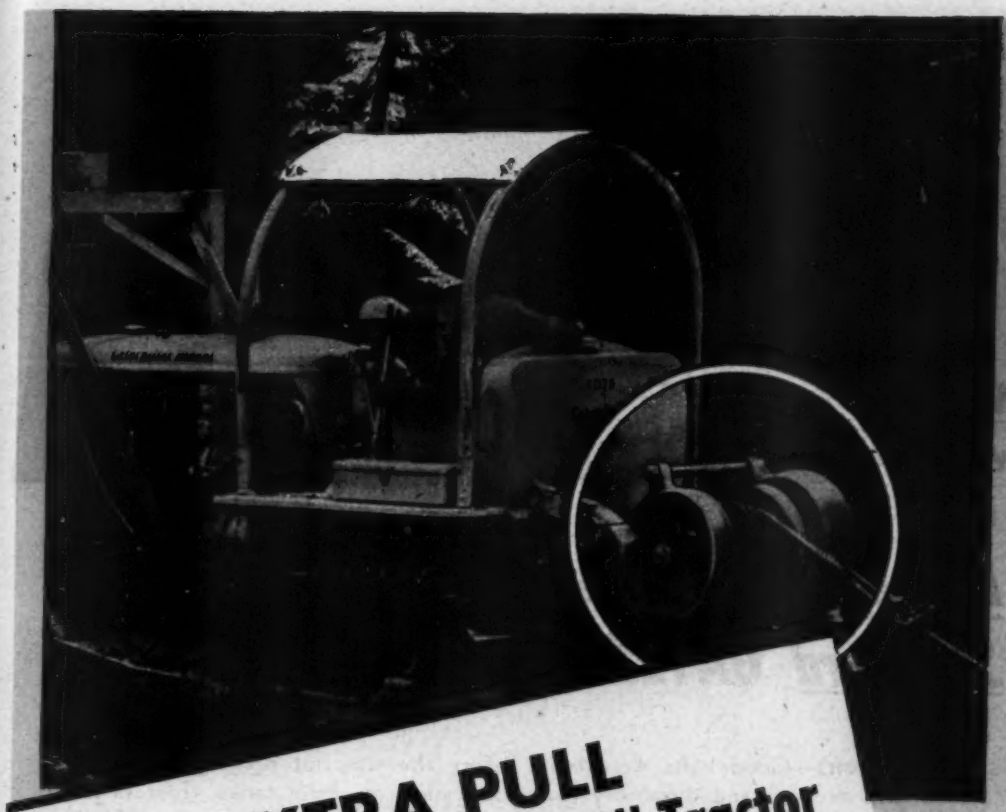
Railroads are having their troubles. But as I remarked earlier in this piece—don't sell your rail stock short—at least not for quite a time.

Where air travel is slightly cheaper

Trip	Air	Rail
New York-Los Angeles	$124.75	$125.87
Salt Lake City-New York	95.95	98.10
Spokane-Portland	15.10	15.86
New York-San Francisco	124.75	127.13
New York-Chicago	35.00	36.93
New York-Omaha	55.50	56.81
Salt Lake City-Los Angeles	31.25	32.66
San Francisco-Los Angeles	15.80	19.12
Salt Lake City-Portland	32.35	37.07
Spokane-Los Angeles	55.90	62.65
Tampa-Mobile	28.45	28.70
Los Angeles-Portland	39.65	46.85
Cleveland-St. Paul	30.15	30.16
Denver-Washington	72.35	73.37
Corpus-Christi-Houston	9.35	10.69
Oakland-Toledo	100.40	100.80
Hartford-Peoria	44.90	45.78
Washington-Boston	20.10	20.21
Boston-New York	9.25	10.54
New York-Seattle	124.75	125.90
Boise-Seattle	24.75	28.41
San Diego-Seattle	51.70	59.65
Oklahoma City-San Antonio	20.60	28.07

Where air travel is slightly more expensive

Trip	Air	Rail
Chicago-New Orleans	$45.80	$38.85
Pittsburgh-Chicago	19.95	19.78
Buffalo-Chicago	23.20	21.54
Chicago-Kansas City	20.40	18.66
New York-New Orleans	62.30	55.74
Pittsburgh-New York	19.10	17.97
New York-Washington	10.85	10.31
New Orleans-Savannah	32.30	27.27
Jacksonville-New Orleans	26.60	25.19
Akron-Denver	57.70	57.23
Cleveland-Tuscon	91.85	84.72
St. Paul-St. Louis	27.05	23.36
Ft. Wayne-Dallas	51.20	43.55
Phoenix-Columbus	89.80	86.78
Chicago-Houston	53.75	46.18
Miami-Philadelphia	56.85	48.37
Tampa-Norfolk	38.60	37.11
Kansas City-St. Louis	12.60	12.15
Dallas-St. Paul	49.85	41.47
Seattle-Philadelphia	122.10	121.98
Los Angeles-Nashville	96.70	89.71
New York-New Haven	3.15	3.07
Cincinnati-Dallas	46.10	40.04
Miami-St. Louis	58.55	53.68
Miami-New York	61.45	56.84
Des Moines-Tulsa	21.75	21.40
Cincinnati-Detroit	12.70	11.31



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"Caterpillar" in a tractor means work ability and tremendous drawbar pull. A Hyster winch on a "Caterpillar" adds more power to pull—50% to 80% more drawbar capacity—an unbeatable combination for the tough jobs.

Hyster Company produces a complete line of tractor equipment for "Caterpillar" track-type tractors; winches, donkeys, yarders, cranes, sulkies, logging arches. *Hyster has specialized in "Caterpillar" equipment since 1929. Hyster is the world's largest maker of tractor winches.*

This means that the same high standards of precision engineering, enduring quality and rugged performance that characterizes "Caterpillars" also are basic features of Hyster products.

It means, also, that more than 300 "Caterpillar" distributors and dealers throughout the world sell and service Hyster tractor equipment.

There is a "Caterpillar" distributor or dealer near you. Ask him about the "Caterpillar"-Hyster combination best suited for your work.

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World's largest manufacturers of Tractor Winches.
Builders of Hyster Industrial Trucks.
Service Offices in principal world cities.

HYSTER

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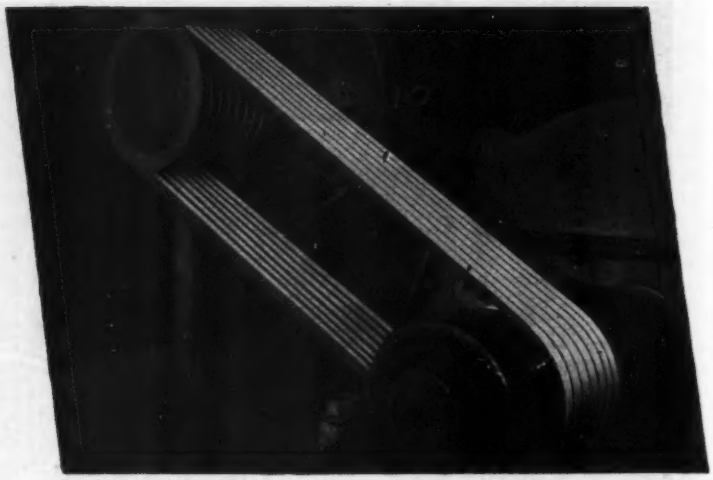

No "Pre-War" Belts
EVER Gave the Service
that is

NOW Being Delivered by Your ***Standard GATES VULCO ROPES!***

Here is the Reason:— Good belts were built before the war but none of them had the strength and durability found necessary on army tanks, tractors and self-propelled big guns. Gates developed these greatly superior V-belts for combat service—and here is why this fact is important to you NOW:—

Every improvement developed by Gates for U. S. combat units has been added, day by day, to the quality of the standard Gates Vulco Ropes which have been delivered to you.

Here is one rare instance in which improvements developed primarily for army combat use can be passed on to you immediately—and there are, of course, good reasons why Gates has not been called upon to withhold these important improvements from industrial V-belt users.

Efficient production in our nation's industrial plants is a prime essential to our winning of the war—and better V-belts than ever before have been urgently needed to keep machines going on the forced-draft, war production schedules that have had to be maintained 24 hours a day!

That is why Gates has been able to embody in the standard Gates Vulco Rope every V-belt improvement which Gates specialized research has developed for use on the Army's motorized equipment—and that is why you are finding that your standard Gates Vulco Ropes are today giving you better service than any V-belts that were built before the war.

All Gates V-Belts are Built with *The Patented*

Gates THE MARK OF SPECIALIZED RESEARCH

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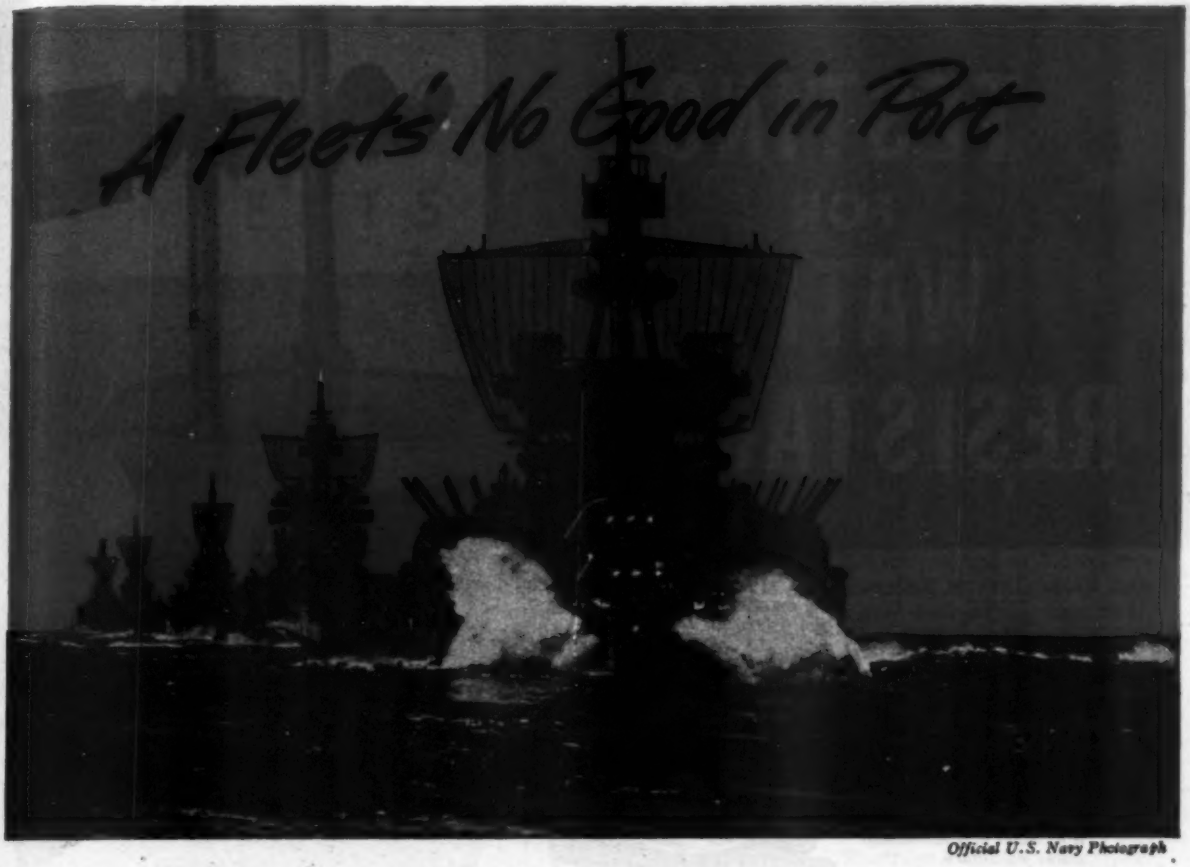
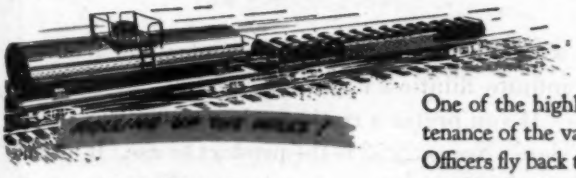


Official U.S. Navy Photograph

Columbia keeps its fleets of Chlorine and Caustic Cars · IN ACTION!



Typical Records . . .

Chlorine Car PPGX 217—
8,742 miles in delivering to eight different industries within 118 days.

Chlorine Car PPGX 223—
8,639 miles in 98 days, also to 8 industries.

Caustic Car GATX 32934—
12,615 miles in 140 days, 14 different industries.

Caustic Car GATX 32941—
10,026 miles, delivering to 18 industries in 140 days.

One of the highly important factors in our Navy's successes has been the maintenance of the various fleets at sea for an extraordinarily high percentage of time. Officers fly back to bases in advance of their fleet's return, for example, to assemble supplies for immediate loading.

Columbia, too, speeds the turnaround of its fleets of special cars. Inspection, reconditioning and loading are handled with all possible dispatch in order to increase the productivity of every car.

Customers and carriers have co-operated in speeding turnarounds and rolling up the miles for a most impressive record for these fleets. This continued teamwork, especially while demands on transportation facilities remain high, will be repaid in the delivery of greater volumes of these essential war supplies.

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This laboratory immersion test verifies what many users have learned from experience . . . that Nopco Wax Sizes give all-around water resistance.

THIS EFFECT is explained in the action of the Wax Sizes which thoroughly coat the entire fiber mass. They adhere to the fiber because they are precipitated by the alum, thus assuring better retention of the wax while the stock is on the wire. Nopco Wax Sizes ride the gamut of specifications to give equally effective results at various concentrations.

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Nopco Wax Sizes help improve finish and feel, increase scuff resistance, and help make coating more effective and economical. If you are a large user of wax emulsions for waterproofing paper and paperboard products, you will find it economical to make your own wax size with Nopco 2251-B Wax Emulsifier. Emulsions prepared with it are *stable* at any concentration, from an infinite dilution up to 70% solids.

If you prefer a ready-made paraffin wax emulsion—Nopco 2252 is the product to use. It effects worthwhile savings in alum and casein costs where the sheet is subsequently coated—contains 50% effective waterproofing solids—is stable in any dilution or under any type of mechanical agitation. We will gladly send you technical data on use of Nopco 2251-B Wax Emulsifier or Nopco 2252 Wax Size.

NOPCO Wax Sizes

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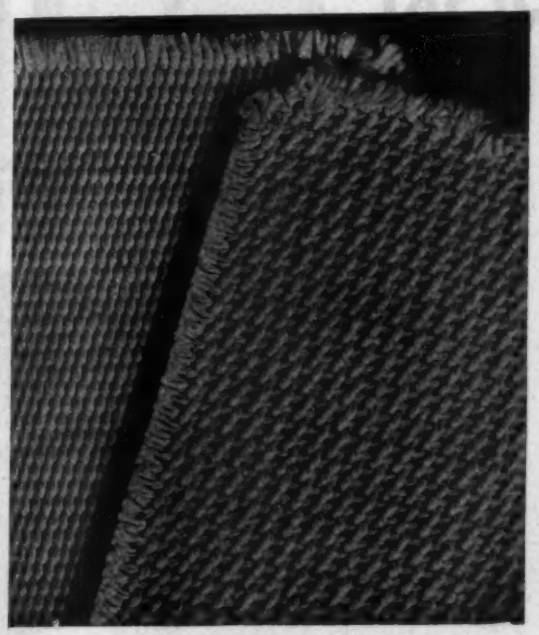

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TRI-UMPH all cotton, 3 ply 53 oz. widths up to 250".

ZEPHYR all cotton, 3 ply 45 oz., widths up to 196".

ZEPHYR cotton-asbestos 3 ply Face 50% asbestos, back open construction for high porosity. Widths up to 166".

HINDLE S/54 all cotton special weave. Extra heavy duty Pre-shrunk, high porosity, widths up to 170".

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SIMPLE DESIGN MAKES THE BAILEY PYROTRON*

STURDY
Flexible
Fast

Multiple recording pens and a bold indicator make for easy comparison of related temperatures and for quick reading.

WHEN experienced instrument men first looked inside the Bailey Pyrotron Resistance Thermometer they asked, "Where are the works?"

The "works" have been simplified by the use of electronics and unit construction.

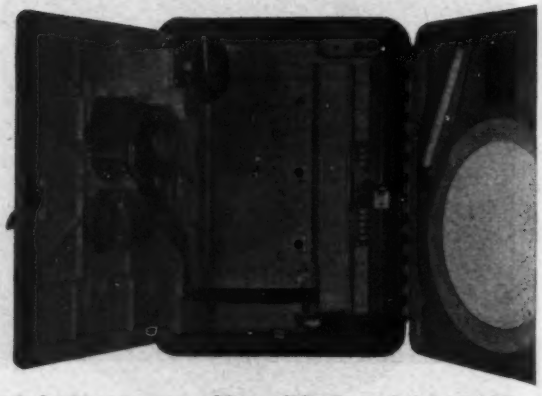
Sturdy inertia-free electron tubes replace the usual galvanometer.

The a-c measuring bridge needs no battery.

A continuously connected circuit and a separate pen for each temperature insure quick response.

Packaged units simplify maintenance and make possible the addition of alarms and controllers to instruments already installed.

For the full story of this unusual Electronic Resistance Thermometer, ask for Bulletin 230-A.



A separate motor driven slidewire unit for each temperature maintains continuous balance, actuates the recording pen and may operate control devices.

Each slidewire unit is controlled by its own independent electronic unit. Electronic units plug into the rear of the casing and are interchangeable.

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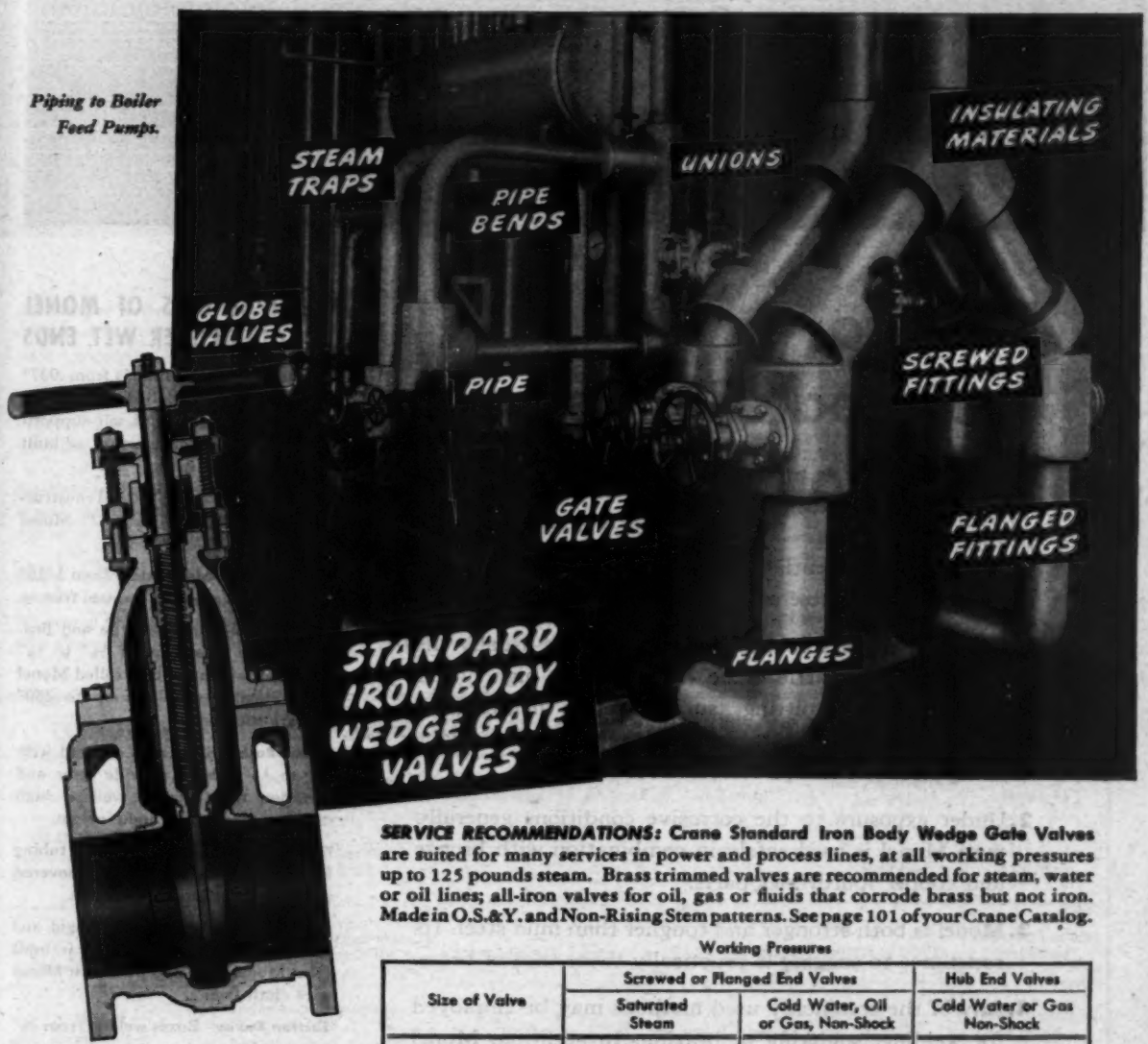

SERVICE RECOMMENDATIONS: **Crane Standard Iron Body Wedge Gate Valves are suited for many services in power and process lines, at all working pressures up to 125 pounds steam. Brass trimmed valves are recommended for steam, water or oil lines; all-iron valves for oil, gas or fluids that corrode brass but not iron. Made in O.S.&Y. and Non-Rising Stem patterns. See page 101 of your Crane Catalog.**

Working Pressures

Size of Valve	Screwed or Flanged End Valves		Hub End Valves
	Saturated Steam	Cold Water, Oil or Gas, Non-Shock	Cold Water or Gas Non-Shock
2 to 12 in.	125 pounds	200 pounds	200 pounds
14 and 16 in.	125 pounds	150 pounds	150 pounds
18 to 24 in.	*	150 pounds	150 pounds

*For steam lines larger than 16-in., Crane 150-Pound Cast Steel Gate Valves are recommended. (For sizes under 2-in., use Crane Clamp Gate Valves.)

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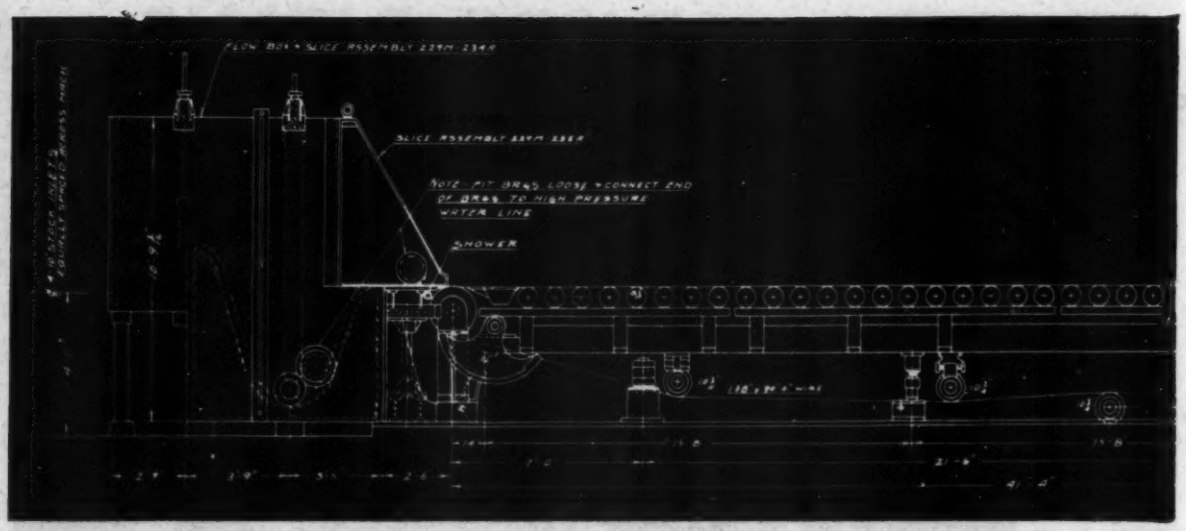


How to combat Corrosion on Fourdriniers

When planning essential replacements and future fourdriniers, consider these advantages of Monel:

1. Corrosive paper stocks and white waters as usually encountered have little or no effect on this high nickel alloy. There is no pitting...surfaces retain their original smoothness. The results shown in the table at the right are typical of Monel's corrosion resistance.

2. Under exposure to the corrosive conditions generally met, Monel is used safely in combination with bronze and copper fourdrinier parts.

3. Monel is both stronger and tougher than mild steel. Its resistance to sagging is practically twice that of brass.

4. Any of the commonly used methods may be employed for welding, soldering or brazing. In addition, Monel is readily machined, drawn or forged.

Ask our technical staff for assistance with your problems. Among the helpful publications available are *"Selection Guide to 28 Problems on Fourdriniers"* and Bulletin C-3 *"Monel, Nickel and Inconel in Pulp and Paper Mills."* Write for copies.

PRINCIPAL USES OF MONEL ON FOURDRINIER WET ENDS

Flow Boxes—Monel linings from .037" to ⅛" thick are applied to wood or steel boxes. Some are of self supporting Monel sheet construction, or built from nickel-clad steel.

Flow Box Midfeathers—Wood construction lined with .037" to .062" Monel sheet.

Apron Plates—Monel strip from 1/16" to ½" thick, supported by steel frames.

Slice Blades—(flat bar type and flexible slices). These are of ⅛" to ¼" thick, special temper cold rolled Monel strip. Flexible slice lips up to 250" long are supplied.

Breast Rolls—Steel rolls covered with ⅛" to ¼" Monel provide wear and corrosion resistance as well as high stiffness at relatively light weight.

Table Rolls—Monel seamless tubing for diameters up to 5". Monel-covered steel tubes for larger diameters.

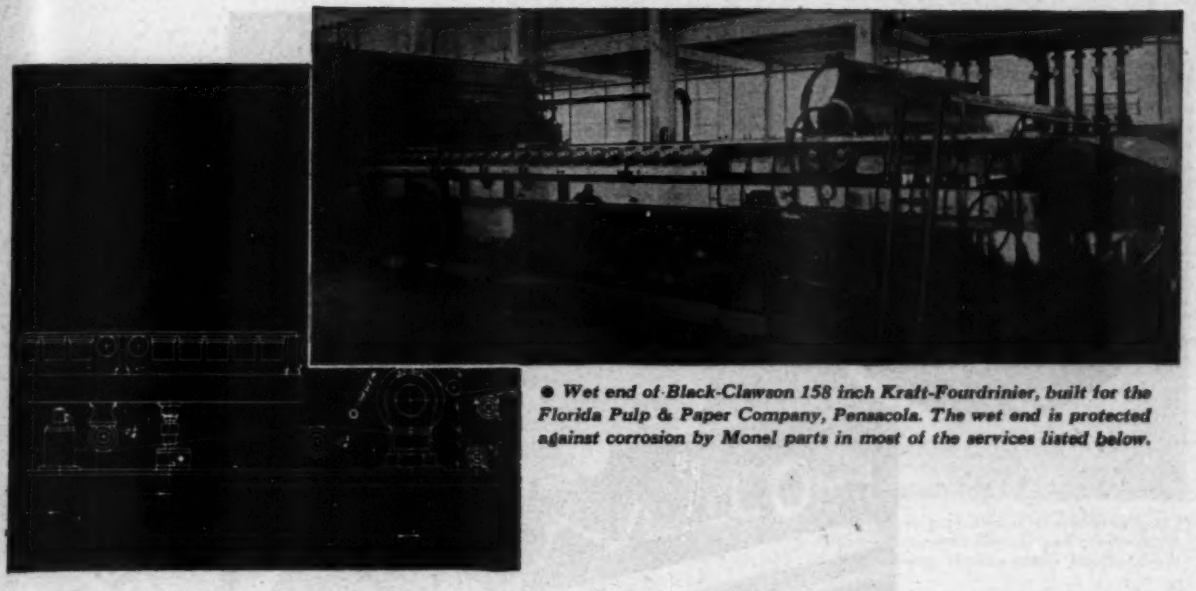
Dandy Rolls—An especially rigid and corrosion resistant roll body is built from Monel strip and wire with Monel wire cloth facing.

Suction Boxes—Boxes welded from ⅛" and ¼" Monel sheet are strong and of light weight.

Suction Box Covers—Monel covers have been used 2 years and more without resurfacing. Covers are made from ¼" thick full hard temper Monel strip.

Monel

THE INTERNATIONAL NICKEL COMPANY, INC., 67 WALL STREET, NEW YORK 5, N. Y.



● *Wet end of Black-Clawson 158 inch Kraft-Fourdrinier, built for the Florida Pulp & Paper Company, Pensacola. The wet end is protected against corrosion by Monel parts in most of the services listed below.*

Wire Return Rolls—Monel covers (⅛" thickness) over steel tubes. Roll covers are ground to finished diameter.

Fourdrinier Rails—.037" to .050" Monel sheet lined steel or cast iron rail construction.

Fourdrinier Side Beams—.037" to .050" Monel sheet lining over steel or cast iron rails.

Shaker Springs—"Z" nickel of full hard temper and age hardened is used for flat spring leaves of shakes with high stroke frequencies.

Save-All Trays and Pans—.062" to ⅛" Monel sheet is used generally for strong, durable, welded construction.

Cross Braces—.025" to .037" Monel is used for lining steel pipes.

Fourdrinier Brace Rods—Cold drawn Monel rods.

Remover Cross Drive Shafts—Cold drawn Monel rods.

Remover Beam Tracks—Gall resisting, high hardness cast "S" Monel for rollers or tracks; companion part is bronze.

Fourdrinier Remover Beams—.025" to .037" Monel sheet covered steel construction.

Shower Pipes & Nozzles—Seamless Monel tubing for pipes, and "R" Monel rod (200 BHN) for machined nozzles provide stiff and wear resisting showers.

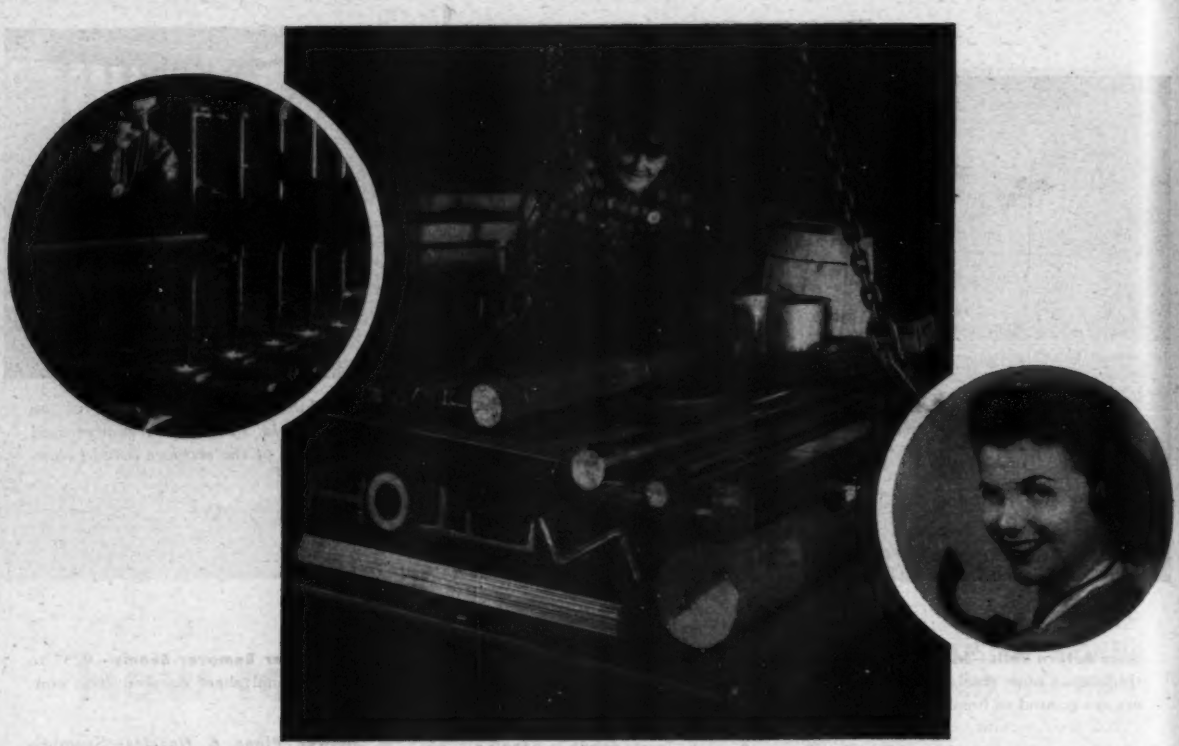
Doctor Blades & Backs—Full hard Monel blades for bronze rolls. Monel sheet and angles for doctor back construction.

Bolts & Other Fastenings—Monel fastenings are used safely in combination with bronze or copper fourdrinier parts.

CORROSION RESISTANCE OF MONEL TO PAPER STOCKS AND WHITE WATERS OF FOURDRINIERS*

Paper Stock	*Location of Monel Specimen*	*Stock Consistency*	*pH of Stock*	*Temp.*	*Corrosion Rate in Inch Penetration per Year*	*Remarks*
DE-INKED PAPER stock containing small amounts of SO_2, CL_2 and H_2SO_4	Immersed in headbox Middle West Mill.....	.....	4 to 4.5	.....	0.0001	Smooth surface, no pitting
NEWS PRINT 80% groundwood, 15% unbleached sulfite pulp	Immersed in headboxes 3 Northwestern Mills.....	2.8% to 3%	4.7 to 5 1	85° F. Average	0.0003 to 0.0014	Smooth surface, no pitting
KRAFT alum treated	Immersed in headboxes Northern Mill..... Southern Mill.....	....	6.5 to 7 4.5 to 6	95° F. Average	0.0001 0.0005	Smooth surface, no pitting
SULFITE bleached pulp	In save-all trough Middle West Mill.....	0.1%	6.8	140° F. Average	0.0008	Smooth surface, no pitting
BOND AND STATIONERY 100% linen and new cotton, rosin and alum sized	In feed line ahead of machine screen Eastern Mill.....	0.5%	6.5 to 7.3	84 to 130° F.	less than 0.0001	Smooth surface, no pitting
CIGARETTE PAPER	In white water box connected with suction boxes Southeastern Mill.....	.....	9.0 to 10.0	66 to 75° F.	less than 0.0001	Smooth surface, no pitting

**Tests conducted by paper mills in collaboration with Inco Development & Research Division. Test method in accordance with ASTM specification A 224-39T.*



4 Things to Know About Steel

1. Where to Find Largest Stocks—The thousands of kinds, shapes and sizes of steel in eleven Ryerson Steel-Service plants are still the largest, most complete stocks available anywhere. This means that, despite shortages in some sizes, you can be more certain of getting the steel you need from Ryerson.

2. Technical Service—For more than 100 years Ryerson has supplied steel for the paper industry. During that period, Ryerson technical men have gained much practical experience about the best type of steel for each pulp and paper making application. This service is available to you on any problem of selection or fabrication.

3. Fast, Accurate Preparation—Ryerson saves you time and expense—prepares steel to your exact specifications with modern, precision equipment. Facilities include high-speed hack saws and shears, batteries of flame cutters, punches—everything needed to cut steel to the size and shape you need in the shortest possible time.

4. Prompt Delivery—Whether you need a single piece of steel or many tons you'll get prompt action from the nearest Ryerson plant. Phone, wire, or write for any steel requirement. And if you do not have a copy of our latest Stock List and Steel Data Book, we'll be pleased to send one.

RYERSON SERVICE TO THE PAPER INDUSTRY INCLUDES:

Steel Bars, Mild Steel, Alloy—Hot Rolled and Cold Finished—Shafting, etc.

Structural Steel including I-Beams, Angles, Channels, Tees, Zees.

Plates and Sheets—all kinds including galvanized, corrugated for roofing and siding, etc.

Inland 4-way floor plate and stair treads.

Rails, Splices, Track Spikes, etc.

Boiler Tubes and Fittings.

Mechanical Tubing—Seamless Steel.

Alloy Steels, Tool Steels.

Allegheny Stainless Plates, Sheets, Strip Bars, Tubing, etc.

Hi-Bond Concrete Reinforcing Bars, Wire Mesh and allied building materials.

Bolts, Nuts, Washers, Rivets, etc.

Welding Rod, Babbitt, Solder.

Ryertex Non-Metallic Bearings, Section Box Covers, etc.

JOSEPH T. RYERSON & SON, INC., Steel-Service Plants: Chicago, Milwaukee, Detroit, St. Louis, Cincinnati, Cleveland, Pittsburgh, Philadelphia, Buffalo, New York, Boston.

RYERSON STEEL

LEFT—E. M. Robinson (at right), manager of Service Department, discusses field service and maintenance problems of the Moist-o-graph with M. J. Ladden for presentation in school course. . . . RIGHT—Moisture in paper is measured and recorded directly and continuously. Record serves as guide for adjusting heat supply to drying rolls at correct value. Instructor discusses Brown Moist-o-graph installation in school lecture room.

Training Service Engineers

For Industrial Instruments

M. J. LADDEN, Supervisor
Industrial Instrument Training School
The Brown Instrument Company

▶▶▶ MODERN INDUSTRIAL instruments have progressed through a period of intensive development begun during the last decade. This rapid and considerable development is attributed to the increasing complexity of industrial process measurement and control problems. Industry depends more and more on instruments to measure and control processes for economical and efficient operation.

Instruments play an extremely important role in the paper and pulp industry from the time the wood enters the pulp mill until the paper leaves the finishing room. First used only in the power plants of paper and pulp mills, instruments are now used not only throughout the mills to measure and control temperatures, pressures, flows, and liquid levels, but in the research laboratories in testing and checking products and new methods of production. These indicating, recording, and controlling instruments must be maintained by individuals trained in the theory and operation of the wide range of instrument equipment employed by industry.

Recognizing the necessity for properly trained service engineers, and as a service to industry, The Brown Instrument Company, Industrial Instruments Division of Minneapolis-Honeywell Regulator Company, in 1935 instituted a full-time instrument training school for the sole purpose of training service engineers, not only for their own organization, but for the personnel of firms using Brown Instruments. As the school is a function of the Service Division under the direction of E. M. Robinson, operating and maintenance problems encountered in the field by service personnel are continually received by the school and supplied to the students. Instruction in the school is conducted by three full-time instructors, possessing engineering backgrounds and extensive field training experience.

More than 3000 men have graduated from the training school as instrument service engineers. Many are employed in the world's largest industrial plants in charge of maintenance and operation of instruments. Some of the trainees have come from South American countries, Mexico, Russia, Iran, China, Persia, Sweden, Canada and England. In some cases entire classes have been composed of technicians of the Armed Forces. Many trainees are college graduates with degrees in mechanical, electrical, and chemical engineering. Students now in training are being prepared for maintenance employment with companies in the steel, oil, chemical, paper and pulp, ceramic, food, power and other of our essential industries.

The complete course, tuition free, of the school requires 13 weeks on an 8-hour day, 5-day week basis. The curriculum includes both lecture and practical laboratory work. Each section of the course is begun with a lecture on the instruments to be studied. The lectures are used to explain the theory, mechanical operation and the application of the instrument in industry. Work in the large and well-equipped laboratory after the lectures provides the student with practical work in dismantling, reassembly, adjustment and calibration of the instrument and its variations. A rotation procedure is followed to assure each student of the opportunity to study and work on each type of instrument, for after the lectures and bench work the student is given an examination on the material covered in the section. A review of the questions and a general discussion of the particular instrument studied follow the examination.

COURSE SCHEDULE

Section	Subject
1.	Pyrometers—Millivoltmeter Type
2.	Potentiometer—Mechanical Type

3. Potentiometer—ElectroniK "Continuous Balance" Type.
4. Automatic Controls—Electrically Operated
5. Flow Meters—Mechanical and Electrical
6. Industrial Thermometers, Pressure Gauges and Hygrometers
7. Automatic Controls—Air Operated
8. Moist-o-graph
9. The CO_2 Analyzer and The Analygraph
10. Resistance Thermometers and Tachometers

As the course is set up in sections consisting of lecture, bench work, and examination for each instrument, each section amounts to an individual course. This provides a sufficient amount of flexibility to permit students, who require training in certain types of equipment, to take advantage of the training by attending only the sections devoted to that equipment.

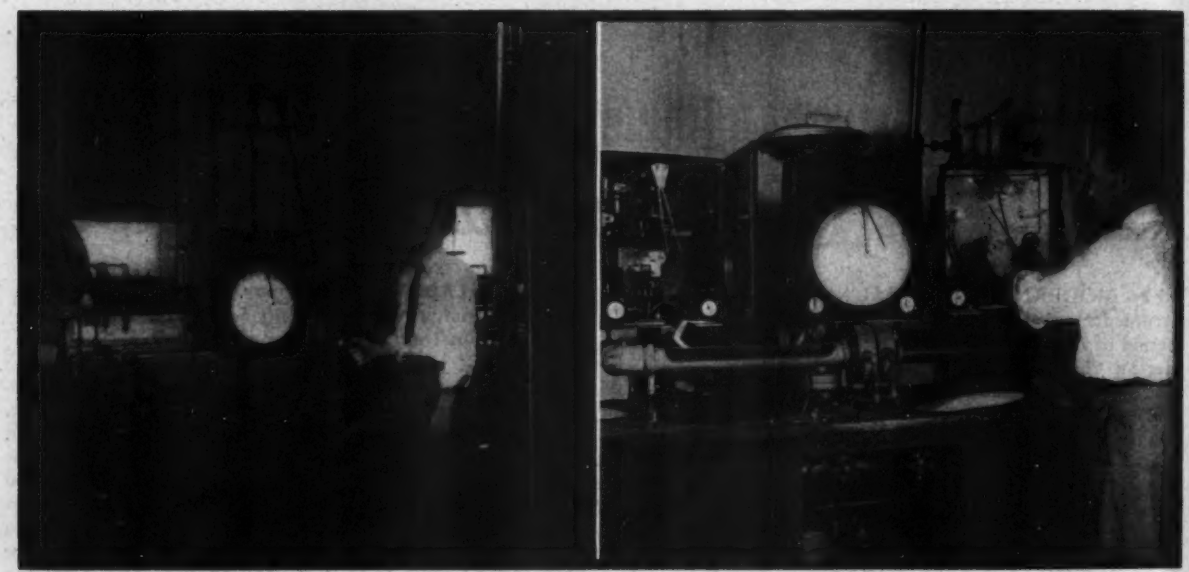
The material covered in each of the 10 sections of the 13-week course is explained briefly in the following paragraphs:

SECTION 1. Millivoltmeter Type Pyrometers

The first section of the course, lasting 15 days, is begun with a review of the fundamentals of electricity, which is of importance to the student as an aid in understanding the principle of operation of the majority of industrial temperature measuring instruments. Immediately following the review, the student is introduced to the fundamentals of pyrometry. In this discourse the principle of the thermocouple, types, and extension leads are explained.

In this first section the instrument studied is the Indicating Type Millivoltmeter Pyrometer for temperature measurement. The lecture is illustrated by drawings and photographs of the instrument on projector slides.

The last half of the section is devoted to the Recording and Controlling Types of Millivoltmeter Pyrometer and its variation, some of which allow as many as 12 temperature records to be made by one instrument. This lecture and laboratory work follow the same procedure as that of the Indicating Type Millivoltmeter Py-



LEFT—The section devoted to flow meters, covers both mechanical and electrical types. Student studies primary measuring devices, meter bodies, interchangeable range tubes; integrators, etc. . . . RIGHT—Students are taught the operation and characteristics of air control systems—bleed and nonbleed—and the four types of controllers, on-off throttler, full throttler, and Air-o-Line, by lecture and laboratory work.

LEFT—Laboratory work on the ElectroniK provides the student with the latest testing and servicing methods for maintenance. . . . RIGHT—Trainee making adjustment on panel-mounted potentiometer. Panel is similar to that used in control rooms of industrial plants.

rometer. The lecturer carefully explains the electrical and mechanical operation of the instrument. Facilities are provided for the instructor to dismantle an instrument in full view of the class, discussing each part and its purpose in the instrument.

As these instruments are slightly more complicated than the Indicating Type Millivoltmeter Pyrometer, the students are given six days of laboratory work.

SECTION 2. The Mechanical Potentiometer Pyrometer

As has been indicated by the schedule of the course, the simpler types are studied first to provide the student with background knowledge. Three types of mechanical potentiometers are studied in the two days of lecture devoted to this section—the indicator, single and multiple recorder, and indicator or recorder and controller. The multiple record mechanical potentiometer, capable of 16 temperature records, is also studied. Laboratory work on these instruments has proven of great value to students.

SECTION 3. The ElectroniK "Continuous Balance" Type Potentiometer

The ElectroniK potentiometer is the latest instrument developed utilizing the mull-method. The amazing performance of this comparatively new instrument has resulted in a steadily mounting demand by instrument-conscious industry. The ElectroniK instrument differs basically from the conventional potentiometer in its balancing operations as it uses an electronic detector and amplifier, which takes full advantage of thermocouple responsiveness, instead of the usual valvanometer and its associated mechanism. It has an unprecedented sensitivity, ruggedness and simplicity. These instruments have been used in all phases of industrial processes involving temperature measurement and control, and have solved some of the most intricate of process problems; however, like other instruments they require maintenance servicing.

In preparation for the study of the ElectroniK potentiometer, the student is lectured on electronic tubes, simple electronic circuits, and the theory of operation of the ElectroniK instrument. A portion of the lecture is devoted to a comparison of the Mechanical and ElectroniK instruments to acquaint the student with points of similarity. Study of the ElectroniK potentiometer includes three types: (1) the Circular Chart Recorder, (2) the Precision Indicator, (3) and the Strip Chart Recorder.

The laboratory work on the ElectroniK instruments provides the student with the latest testing and servicing methods for maintenance programs.

SECTION 4. Electrically Operated Automatic Controls

This section is begun with lectures on the theory of operation and the types of electric controls. The equipment studied by the students includes motorized valves; Lindberg controls; the Beck mechanism (proportioning and reset); A.T.C. relays, timers, and input controllers; the Optimatic (automatic optical pyrometer); the Radiamatic (radiation pyrometer), and the Protectoglo combustion safeguards. Minneapolis-Honeywell Regulator Company controls for temperature and pressure are included in this section.

SECTION 5. Flow Meters

The section devoted to flow meters, for measuring steam, water, oil, gas, and other liquids, covers both the electrical and mechanical types. As in the other sections, the student is thoroughly grounded in the theory and fundamentals of the subject and is then taught the remainder of the course in the laboratory. The student studies primary measuring devices, meter bodies, interchangeable range tubes, integrators, and piping assemblies for various types of installation, and proper installation procedures.

SECTION 6. Industrial Thermometers, Pressure Gauges & Hygrometers

The lecture and laboratory for this section is divided into three parts, one part being devoted to each type of instrument.

The lecture is begun with the theory and operating principle of the remote reading industrial pressure-type thermometer and includes the indicating, recording and the indicating or recording and controlling instruments. Types of actuating elements, spiral and helix, are discussed along with the filling mediums and the ranges for the various filling mediums. The lecture and laboratory include study and work on the multiple pen instruments, having as many as three actuating elements and pens to continuously record three different temperatures.

Four types of pressure gauges having helix, spiral, Bourdon tube, and bellows actuating elements for remote reading instruments are studied. This includes the indicating, recording and indicating or recording and controlling instruments in addition to multiple pen instruments which continuously record up to three different pressures.

Two types of hygrometers for humidity measurement and control are studied in the training school: the wet and dry bulb and the hair hygrometer. Each type of hygrometer instrument, indicating and recording, is fully explained after the student has been lectured on the theory and operating principle.

SECTION 7. Air Operated Automatic Controls

In this section, after theory, students are taught the operation and characteristics of air control systems —bleed and nonbleed—and the four types of controllers—on-off, throttler, full throttler, and Air-o-Line. By the use of slides and other illustrations, the application of air control to temperature, pressure and flow measuring instruments in various processes, batch and continuous, is explained to the student. Pneumatic transmission equipment and operation is given the student in the lecture. Valve positioning mechanisms and power pistons are also taught in this section.

SECTION 8. The Moist-o-Graph

Of particular interest to the textile and paper industries in controlling the moisture content of their products, the Moist-o-Graph is covered by lecture and laboratory work in a manner similar to other instruments. The recording and recording controlling instruments and the control equipment (timers, etc.) and their application and installation are studied.

SECTION 9. The CO_2 and Analyzer Analygraph

The instruments and equipment used in the analysis of flue gas for the carbon dioxide content and the Analygraph for indicating the presence of hydrogen in an atmosphere, are studied in this section.

SECTION 10. Resistance Thermometers and Tachometers

In this section the Resistance Thermometers of the type which use a bulb composed of an electrical conductor, which varies its electrical resistance with changes in temperature, are studied. The resistance thermometer consists of either millivoltmeter or potentiometer type instruments. The type of connections used between the instrument and the temperature sensitive device is of the three wire system eliminating compensation for varying lead lengths.

The section includes the tachometers attendant equipment, the generator and the millivoltmeter and potentiometer instruments.

German Research on the Use of Sodium Chlorite in the Manufacture of Wood Pulp and Cellulose*

G. P. VINCENT, Technical Director
The Mathieson Alkali Works (Inc.)

2—Digesting Cellulosic Raw Materials in Sodium Chlorite

As described in the first article of this series (1), German research workers found that, when sodium chlorite is used for bleaching wood pulp, it destroys lignin and other colored substances in the pulp without attacking cellulose or the associated hemicelluloses, thereby confirming and extending American work.

This unique property of the new bleaching agent suggested another line of research to the German technologists—the direct digestion of cellulosic raw materials of many different kinds in strong solutions of sodium chlorite. By using this procedure, one group of investigators was able to prepare excellent paper from wood and various annual plants, while a second group succeeded in developing a new method for isolating the total polysaccharide substance of the wood (holocellulose) in a form that permits a study of the chemical structure of this cell wall constitutent.

Digesting Wood with Chlorite—Sohn and Reiff (2), of the research laboratory of the Waldhof, Johannesmuehle, pulp mill, digested pine, spruce, and beech chips with sodium chlorite, in accordance with data given in Table 1.

The raw material, in batches up to 400 grams, was first covered with the major part of the sodium chlorite solution (dilution not given), which was acidified with hydrochloric or other acid. The rest of the solution was added gradually, with the last 5 per cent to 10 per cent of the salt (referred to the wood) being reserved until near the end of the digestion.

The chlorite solution became yellow to brown in color, due to the release of chlorine dioxide, and then it was found advisable to add a buffer to increase the pH of the solution, reduce hydrolysis of the polysaccharides, and accelerate reaction. Pyridine, quinoline, sodium acetate, and disodium phosphate were found suitable for this purpose. When pyridine was used, the pulp had to be deacidified after digestion.

(*) This article is the second of a series on the same subject. The first was published in the July issue of this magazine; the third will appear in a subsequent issue.

Table 1 — Digesting Wood Chips with Sodium Chlorite

Kind of Wood	Pine	Pine	Spruce	Beech
Lot No.	2	4	5	6
Per cent $NaClO_2$, ref. to wood	125	75	100	125
pH, starting value	2.0	2.5	2.0	2.0
Buffer	Pyridine	CH_3COONa	Pyridine	Pyridine
Per cent Buffer, ref. to wood	150	50	50	50
pH, after adding buffer	5.4	4.3	5.1	5.3
Time of digestion, hours	24	27	30	96
Temperature, C.	50-60	50-60	60-70	60-70
Per cent yield	52	56	58	54
Polymerization degree	1,540	1,300	1,330	1,200

On contact with the chlorite solution, heartwood at first turned a reddish color and sapwood was immediately bleached. When the solution penetrated to the interior of the chips, the reaction was completed, and the soft, yellowish to white material was washed, beaten, and, when necessary, sifted.

The resulting pulp had a silky sheen and was wholly or partly insoluble in Schweizer's reagent, indicating the presence of some chemically bound lignin-carbohydrates. By allowing it to stand in 5 per cent sodium hydroxide at room temperature, the pulp became soluble, lost its silky sheen, and took on the appearance of normally bleached cellulose.

Table 2 — Effect of Treating Pulp Lot No. 4 With 5 Per Cent NaOH

Per cent	Untreated	Treated
Yield	56	50
Alpha-cellulose	78.5	91.6
Wood resin	16.8	7.1
Pentosan	8.9	6.9

As shown by Table 1, the polymerization-degree values varied with digestion conditions, but that of 1,540 for Lot No. 2 is said to be the highest ever found in pulp. (Staudiger gives 1,500 as maximum for cellulose from wood.) It was possible, therefore, to carry out sodium chlorite digestion with no decomposition whatsoever.

The yields given in Table 1 were higher than those obtained in making bleached sulphate pulps from the same raw materials, because of the considerably higher content of hemicelluloses. As these substances were removed by sodium hydroxide, treatment with this chemical lowered the yield but increased the alpha-cellulose content, as shown by Table 2.

The chlorite pulps, with their content of hemicelluloses retained, developed their maximum strength values with 60 minutes of grinding and formed papers that had a pronounced parchment-like character and were greaseproof. Table 3 gives comparative strength data.

Digesting Annuals with Chlorite—These investigators also experimented with the use of sodium chlorite as a digestant for rye straw, potato tops, esparto, corn stalks, sunflower stalks, tobacco stalks. Typha and Phalaris reeds, and rape (2).

Details for typical experiments are given in Table 4. The procedure in each case was similar to that employed for digesting wood, except that much

Table 3 — Comparative Pulp Strength Characteristics — Pine

	Chlorite Lot 4	Sulphate Unbleached	Sulphate Bleached
Tearing length (meters)	13,360	10,000	9,000
Per cent Elongation	4.6	4.0	2.5
No. double folds	2,750	5,000	3,500
Bursting pressure (kilos per sq. cm.)	8.3	7.2	5.0
Duration of grinding (min.)	70-100	200-240	110-120
Pulp slowness, deg. SR	74-91	89-91	90-91

Table 4 — Digesting Annual Plants with Sodium Chlorite

Material	Rye Straw	Potato Tops	Esparto	Corn Stalks	Sunflower Stalks	Tobacco Stalks
Pretreatment	None	A	B	None	C	C
Per cent $NaClO_2$, ref. to material	40	32	20	28	20	24
Acidified to pH	2.5	2.5	3.0	2.5	2.5	2.5
Buffer	Pyridine	CH_3COONa	None	CH_3COONa	None	None
Per cent Buffer	20	20	..	30	..	..
Time of digestion, hours	48	48	20	20	25	27
Temperature, C.	50	50	60	60	60	60
After-treatment	D	E	F	C	None	F
Per cent yield	56	45	52	49	32	35
Whiteness, MgO = 100	88	85.5	88	85	86	88
Polymerization degree	1,250	1,170	1,160	930	1,100	1,300
Per cent alpha-cellulose	77	80.2	83.2	78.0	77.0	83.1
Per cent wood resin	23.2	12.0	20.7	24.0	21.4	17.4
Per cent Pentosan	22.8	10.8	20.2	21.2	21.0	16.8

A—Mud washed off.
B—15 minutes with 0.25—N NaOH.
C—1 hour with 0.25—N NaOH.
D—30 minutes with 0.1—N NaOH.
E—30 minutes with N NaOH.
F—Cooked in pretreatment liquor.

Table 5 — Comparative Pulp Strength Characteristics — Annuals

Material	Rye Straw — NaOH Treated Chlorite	Rye Straw — Technical	Potato Tops	Esparto	Corn Stalks	Sunflower Stalks	Tobacco Stalks	Bleached Pine Kraft
Tearing length, meters	11,800	600-7,000	8,750	8,480	8,340	8,550	7,830	9,000
Per cent Elongation	5.1	....	4.5	4.3	3.5	3.9	3.7	3.5
No. of double folds	4,800	200-750	3,470	....	2,420	580	5,411	3,500
Bursting pressure, kilos per sq. cm.	6.5	....	5.3	5.7	4.9	2.9	4.8	5.0
Duration of grinding (min.)	60	....	90	80	40	40	40	110
Pulp slowness, deg. SR	93	....	83	80	89	36	86	90

smaller amounts of sodium chlorite were required. In fact, they prepared good pulps with the use of as little as 10 per cent of chlorite, referred to the raw material, but they did not attempt to determine optimum proportions. Nor was the use of a buffer as important as it was with wood; the cellulose from annual plants was not injured at a pH of 2 and a temperature of 50 C.

It was found, however, that chlorite digestion did not leave the cellulose fibers well separated but largely bound together in bundles by inorganic compounds, such as silicic acid. To break up these bundles, the material was boiled in caustic soda, either before or after digestion, as shown in the table. After-treatments with caustic were followed by deacidification.

The raw material was also boiled under pressure with chlorite but did not produce better pulps; and the investigators point out that chlorite digestion is advantageous because it eliminates the need for pressure cooking.

Table 5 shows the strength characteristics of the pulps listed in Table 4, with figures for technical rye straw and bleached pine kraft pulps for comparison.

Preparing Holocellulose with Chlorite

Jayme (3), in collaboration with L.Bechtolsheimer, developed the folknowing method of preparing holocellulose from wood.

Microtomed sections, 40 to 80 microns thick, were cut from 60-year old spruce and were first digested 6 to 8 hours in a methanol-benzol mixture, which extracted 2.81 per cent of resin. The treated material contained 28.24 per cent of lignin.

This material, at a pulp density of 3 per cent, was then treated four times at 60 C. in a closed flask with 30 per cent of sodium chlorite and 6 per cent of glacial acetic acid, both percentages referring to the weight of the wood

Table 6 — Spruce Holocellulose Data

Yield, referred to extracted wood	74.06%
Lignin content	3.05%
Yield, assumed to be lignin-free	71.80%
Theoretical yield	71.76%
Yield after treatment with 1% NaOH—	
Referred to holocellulose	82.49%
Referred to extracted wood	61.09%
Lignin content of NaOH-treated yield	0.03%
Yield of nitrate, from holocellulose (slightly soluble in acetone)	148.60%
Nitrogen content of nitrate	12.76%
Yield of nitrate, NaOH-treated material (readily soluble in acetone)	161.20%
Nitrogen content of nitrate	13.32%
Average degree of polymerization, NaOH-treated material—	
0.1% concentration	1,325
0.03% concentration	1,718
Copper number	1.62
Mannan content	13.18%
Furfural content, by HBr	7.2%
Alpha-cellulose content (Contains mannan, galactan; splits off furfural)	69.91%

after the extraction of the resin. The first two chlorite treatments were continued for 12 hours, the last two for 8 hours. The resulting material was washed but not dried.

The results are summarized in Table 6, which shows that the yield of holocellulose, after deducting its lignin content of 3.05 per cent, agrees precisely with the theoretical value.

A similar residue of lignin, ranging in amounts of from 2.8 per cent to 3.5 per cent, was always found in cellulose after digestion with sodium chlorite, according to the investigators, and they stress the fact that it could not be removed without loss of polysaccharide substance.

To remove the residual lignin, the cellulose was treated with a 1 per cent solution of NaOH for 1¼ hours at 20 C. This treatment also destroyed the woody structure retained by the digested material and produced well-separated fibers, which led the investigators to believe that the residual lignin and the alkali-soluble polysaccharides form part of the "O" layer of the middle lamella and assist in cementing the fibers together in the wood. They also believe that this agglutinating property is not only mechanical but also chemical in nature and indicates the presence of lignin-hemicellulose compounds.

By use of the same procedure, the theoretical yield of holocellulose from beech wood was also obtained.

(Turn to page 884)

Animal Glue as a Paper Sizing and Coating Adhesive *

H. B. SWEATT
National Association of Glue Manufacturers, Inc.

▶▶▶ ANIMAL GLUE also has its advocates in the manufacture of coated papers. Although certain other adhesives have sought in recent years to challenge the position of animal glue in this application, animal glue has continued to hold a definite acceptance, particularly for certain coated specialties. These specialties include playing card stock, glazed papers, wall papers, metal coated paper, and other special surfaced papers used largely for magazine, book, and catalogue printing and illustrating.

Glue bound coatings seldom act differently from coatings prepared with other adhesives. Such coatings are prepared by suspending a mixture of mineral and adhesive, usually casein, glue or starch, or a mixture of them, in water and adding, in some cases, waxes, soaps, or similar softening or finishing agents.

Animal glues of widely varying types may be used for coating purposes. Whatever the kind of glue chosen, it is of utmost importance that it is of known quality and properties. Only in this way can uniform and satisfactory coating be obtained.

In the selection of a glue, it is well to remember that the adhesive power of glue varies with the grade. Gel strength and viscosity are extremely important. Clay-suspending power, solubility, grease content, odor and color are also factors that require consideration. And finally, although by no means least important, consideration must be given to price, product requirement, and local coating conditions.

The importance of these factors cannot be over emphasized. To a great extent, they determine the success of the coating operation. They indicate whether it is necessary to provide a means of heating glue-bound coating mixtures above normal room temperatures in order to keep the mix sufficiently fluid for coating purposes. They assist the user in determining what grade of glue to use. Only by knowing the grade can proper proportions be ascertained. It takes less high grade glue than low grade to produce a given degree of adhesion.

The adhesiveness of animal glue, measured by the amount required to hold the mineral matter of the paper coating firmly to the body stock, may be determined by the sealing wax pick test. In making this test, small quantities of coating mixtures are prepared with different proportions of adhesive, or with the same proportions of different adhesives, the other ingredients being kept constant. Then, sheets of paper are coated by hand from the small mixes and permitted to dry thoroughly. Next, small pieces of sealing wax, softened at one end by warming, are applied with firm pressure to portions of each sheet where the coating is uniform.

When the wax has cooled, each stick is drawn away from the paper by a steady pull. If the adhesive is weak, the clay mixture will be pulled away from the paper by the wax; if the bond is sufficient, the paper fibers will also be pulled away. As a matter of fact, a well bound coat usually tears the paper completely through.

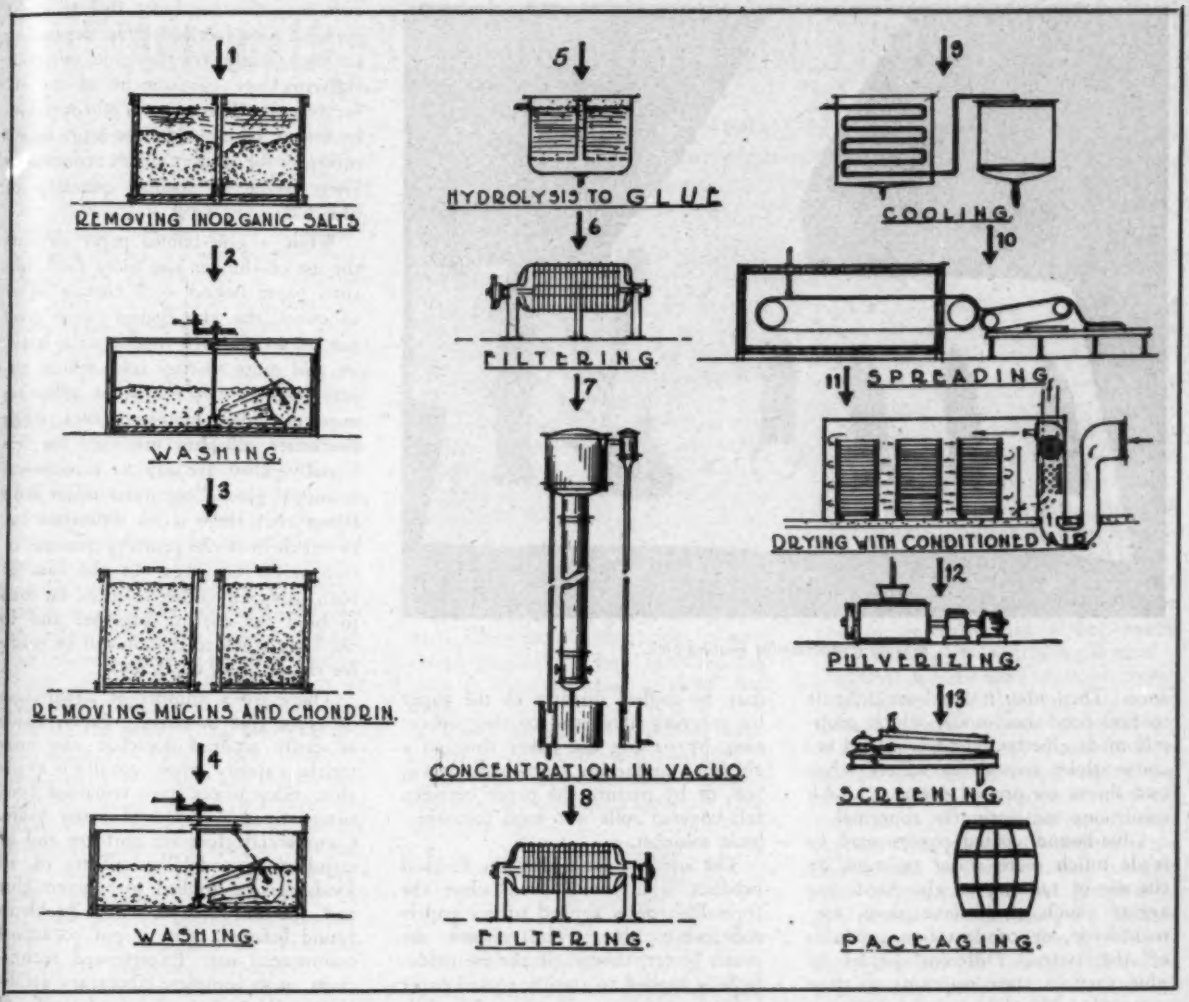
The pick test is only comparative. It is not conclusive in itself. Long experience and exact knowledge of local conditions is definitely required to translate the results of the test into satisfactory machine coatings.

Pigment retention in uniform suspension in coating mixtures is characterized by marked variations in the capacities of different adhesives. The clay-suspending qualities of a comparative series of glues do not always improve uniformly with increasing grades. They frequently increase or diminish with like changes in a glue's adhesiveness as indicated by the pick test. Lots from different sources within a particular grade of glue often reveal marked differences in clay-suspending powers.

The clay-suspending powers of different glues may be tested easily. To

Grease test. (From Animal Glue Information Service)

(*) This is the second and concluding installment of this article. Part I appeared in the August (1945) issue of this magazine.



Steps in the manufacturing of animal glue. (From Animal Glue Information Service.)

do so, small amounts of coating mixtures are prepared with the different glues, just as in the pick test for adhesiveness. Then these mixtures are poured into cylinders of the same diameter and to the same depths. When the mineral in each mix settles out, the respective volume is measured for clay-suspension.

Although animal glues are most water-resistant when very slightly acid, neutral glues do not tend to react with coating mixes containing alkaline pigments, such as satin white pigment. Glues which are only slightly acid present the smallest problems in the preparation of color mixes. They can be bought in most grades. With values specified for limiting acidity, a good figure would be *p*H 6.0-6.4.

The grease content and foaming tendency of animal glues are interrelated. In the case of a given glue, the reduction of grease is usually accompanied by an increased tendency of its solution to foam.

Glues with too little grease content dust the coating during the calendering operation. Therefore, a foam test should be made of a glue that is to be used in a coating mix. Such a test is made by agitating a sample of the glue solution with an egg beater or mechanical mixer for a specified length of time, and then measuring the amount of foam formed.

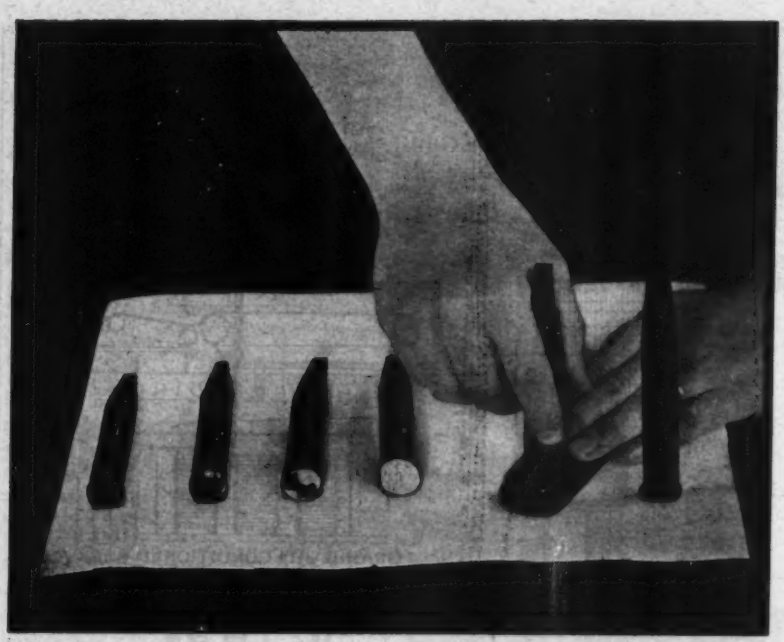
Too much free grease in coating glues is undesirable because it spots the coated surface. To determine the grease content of a particular glue, a "spot" test may be made. To do so, a small amount of concentrated solution of an organic dyestuff, such as magenta, is added to a sample of the glue solution. Next the colored mixture is painted on unsized white paper with a camel's hair brush. Then, the round, light colored grease spots which appear are counted in a given area. This count determines the relative grease content.

Domestic glues, which are so free of grease as to cause no coating spot whatever are to be had in all grades.

Modern glues are amply preserved and protected against bacterial effects. Reasonable cleanliness, therefore, is but good housekeeping and pays dividends in the efficient use of any adhesive.

Ninety per cent of the coated papers produced in the United States find their way into the graphic arts field. The greatest amount of these papers are diverted to ordinary printing and halftone illustrating, such as is found in books, magazines and catalogues. There is a good deal of doubt about the importance of water resistance in such coated papers. In such applications, there is no great need of damp-proofness. In certain of the printing processes, however, such as where there are repeated impressions of multicolor work, there must be enough water resistance in the paper to withstand smudging or discoloration.

There is no standard method of testing coated papers for water resist-



Making a wax test for coating pick.

ance. Then, too, it has been difficult to find conditions under which properly made glue-bound paper would become sticky enough to adhere when two sheets are pressed together. Such conditions are distinctly abnormal.

Glue-bound coated papers may be made much more water resistant by the use of tanning or glue-hardening agents: such as, chrome alum, formaldehyde, or condensation products of the latter. Different grades of glue vary in their reactions to these materials. The higher grades require less of any tanning agent than the lower grades in developing the same degree of water resistance.

Formaldehyde, which is an excellent tanning agent for glue, has no effect on the color of the papers treated. It may be applied directly to the paper by spraying after the coating operation, by passing the paper through a chamber containing formaldehyde vapor, or by passing the paper between felt-covered rolls wet with formaldehyde solution.

The water resistance of the finished product is increased even when the formaldehyde is applied to dry papers containing glue. The results are much better, though, if the formaldehyde is applied to freshly coated paper before it is thoroughly dry. The best results of all follow the use of formaldehyde in the coating mixture.

The viscosity of coating mixtures bound with medium grade glues is best suited for applying at about 85 Fahr. At this temperature, the mixture may contain from five to eight per cent pure formaldehyde, depending on the weight of the glue, without suffering any curtailment of its effectiveness. The amount of formaldehyde may be increased for more dilute mixtures or those which contain a lower grade or smaller quantity of glue.

While a glue-bound paper permits the use of thinner and more fluid inks than paper bound with certain other adhesives, the glue-bound paper gives just as satisfactory results with heavier and more viscous inks which papers bound with the other adhesives must use. As a matter of fact, while the other adhesives may sell for less initially, they are not as economical as animal glue. Continued use of both shows that there is no difference between them in the printing qualities of comparable coatings. In the case of both, sufficient adhesive must be used to bind the coating together and to the body stock so that it will be ready for the printing operation.

There are a number of advantages in using glue in coating paper. Made of easily secured domestic raw materials, a steady supply usually is available. Glue prices have remained consistent over a period of many years. Commercial glues are uniform and of standard dependability. Tests of all kinds can be applied to a given glue and the answers to many problems found before a glue is put to actual commercial use. Experienced technicians, with complete laboratory facilities at their disposal, stand ready to assist the user of animal glue, if his specific and individual problem is in need of expert assistance. These services can be secured through the supplier of glues to the commercial market.

German Research on the Use of Sodium Chlorite . . .

(Continued from page 881)

In this connection, it may be mentioned that Wise, of the Appleton, Wisconsin, Institute of Paper Chemistry, has employed a modified form of Jayme's process for isolating the holocellulose of redwood, Douglas fir, and other conifers (4).

"The method," he says, "appears to have the following advantages: It gives a quantitative picture of the hemicellulose content of the wood and permits further investigation of the hemicellulose fractions; preliminary removal of the extractives is unnecessary; the reagents cause little degradation of the wood polysaccharides; the technique is simple, reproducible, and fairly rapid; and the method permits a summative analysis of the wood in which all important components may be determined separately and directly —i.e., in which a summative analysis may be made of the cellulose, hemicellulose, lignin, and extractives."

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Automatic Switching of Shunt Capacitors

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▶▶▶ CAPACITORS have made it possible to supply large increases in load with existing power facilities. This addition of capacitors to release system capacity has played an important role during the present war emergency with its shortage of materials and labor. When more and more capacitors are added to a system, however, a situation is reached where their effect becomes objectionable during certain operating conditions. It is, therefore, desirable to obtain the benefits of additional capacitor correction without the objectionable aspects.

A relatively small capacitor may be connected to a circuit with very little effect upon the performance of the circuit. As the size of the capacitor increases, the addition or removal of the capacitor has an increasing effect upon the circuit voltage, line current, line losses and circuit power factor. The line losses are at a minimum when the capacitor kilovars are the same as the load kilovars. The maximum benefits are, therefore, obtained by switching the correct size capacitors at the appropriate time. Because of the large increase in the use of shunt capacitors within the past few years, the power systems are rapidly approaching the point where capacitors must be switched automatically in order to obtain the maximum benefits of capacitor correction.

I Methods of Switching Capacitors

Capacitors may be switched manually with variation in load provided a reliable attendant is available to observe the operating conditions such as voltage, kvar, etc., and perform the desired switching operations.

If it is found desirable to switch capacitors with variation in load, consideration should be given to distributing the capacitors out on the circuit and connecting them directly to the motor terminals to be switched "off" and "on" with the motor without additional switching equipment. The size of the capacitor switched with the motor switch should be selected to avoid excessive overvoltage due to self-excitation. In some cases it may be desirable to use a separate switch for the capacitor and let the motor control initiate the opening and closing of the capacitor switch.

A time switch may be used to initiate the switching operations in some cases provided the load variation follows a repetitive load pattern each week.

Capacitors may be switched automatically in response to changes in load. The three generally accepted methods of switching capacitors automatically are:

1. Voltage control
2. Current control
3. Kvar control

II Application of Automatic Control Equipment

The switching of capacitors may be desired to prevent overvoltage, improve voltage regulation, reduce line current, to keep the demand low in proportion to the kilowatt loading or keep the overall power factor within desired limits to maintain minimum cost of power purchased under certain rate schedules.

In deciding whether or not the capacitors should be switched automatically, consideration should be given to the size of the capacitor banks, the extent to which the kilowatt and kilovar load varies over a typical load period, the variation of voltage with load and benefits desired. In making an analysis, it is usually desirable to make measurements of kilovars, kilowatts, and voltage over a typical load period to determine the capacitor kilovar requirements and then if automatic switching is needed to determine what type of control would be best suited for actuating the switching device.

When objectionable voltage variations occur with varying loads, the voltage control shown schematically at the left in Figure 1 should be considered. If the principal reason for switching the capacitors is to avoid overvoltage on lamps and motors during light load periods, the requirements usually can be met by using a single step voltage control that disconnects the capacitor bank when the voltage rises above a certain value and reconnects it when the voltage falls below a predetermined level.

This single step voltage control is especially useful in a plant where a number of induction motors are switched off during rest periods or at night. As the motors are shut down, the voltage control disconnects the from rising too high. As the motors are switched on again, this process is

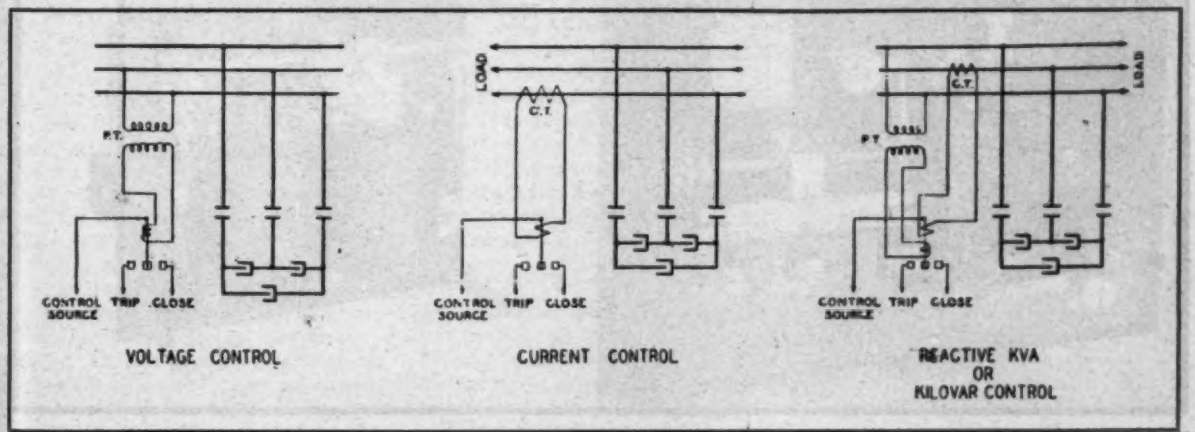
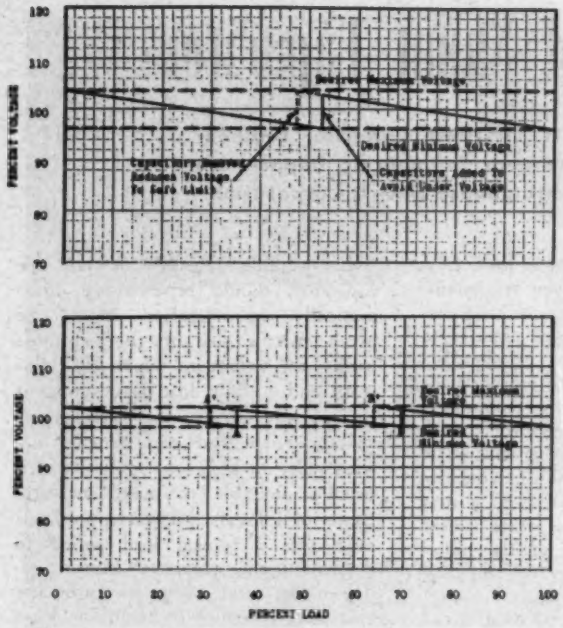


Fig. 1—Voltage control, current control, and kvar control methods of automatically switching capacitors illustrated schematically.



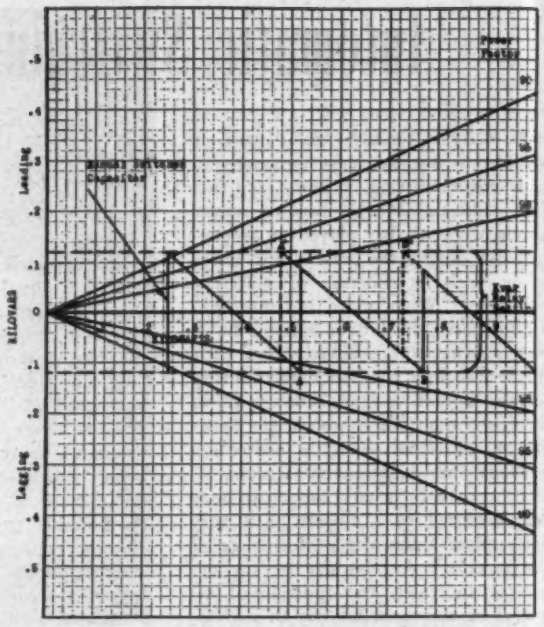


Fig. 2 (left above)—Graphic illustration of voltage regulation by means of single step switching in response to changes in circuit voltage. . . . Fig. 3 (left below)—Graphic illustration of voltage regulation by means of multistep switching in response to changes in circuit voltage. As load increases, the voltage drops and capacitors are added selectively at A and B to boost voltage. As load drops, and the voltage rises, the capacitors are removed selectively at B' and A' to reduce the voltage. . . . Fig. 4 (right)—Graphic illustration of kvar regulation by means of multistep capacitor switching in response to changes in kilovar load. As load increases, the lagging kilovars increase and capacitors are added selectively at A and B to keep the kvar demand within desired limits. As the load decreases, the lagging kilovar load decreases and capacitors are removed selectively at B' and A' to keep the kvar demand within desired limits.

reversed to keep the voltage from falling below normal.

If voltage regulation is the primary objective of the capacitor switching installation a multistep voltage control is usually required to hold the circuit voltage within the set limits. The multistep control is particularly useful on the longer distribution circuits and plant feeders that extend some distance beyond the voltage regulators. Unlike the ordinary voltage regulator, however, the capacitor bank with multistep voltage control improves the voltage regulation on both the supply and the load side of the bank by reducing the current flowing in the supply feeders. This is accomplished without changing the existing regulating equipment and lowers the IX and IR losses in the circuit. If the voltage change produced by the capacitor is greater than the difference between maximum and minimum desired voltage limits then multistep voltage control should be used. Figure 3 illustrates graphically a case where one-half the capacitors produce a voltage change less than the difference between the desired upper and lower voltage limits. For this situation two switched capacitor banks and a two-step voltage control are used to obtain satisfactory voltage regulation.

If the load with which the capacitors are associated is small in comparison with the total load on the circuit then the addition or removal of the capacitor bank will have little effect on the circuit voltage. In this case the voltage control may cause the

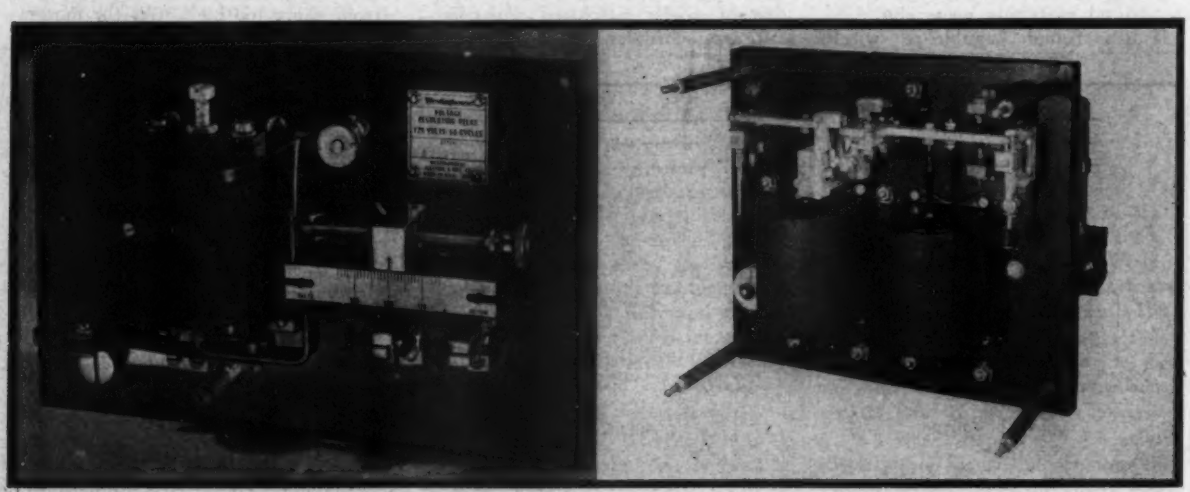


Fig. 5 (left)—Voltage regulating relay used for initiating the automatic switching of shunt capacitors in response to change in circuit voltage. Fig. 6 (right)—Kvar regulating relay used for initiating the automatic switching of capacitors in response to change in kvar demand.

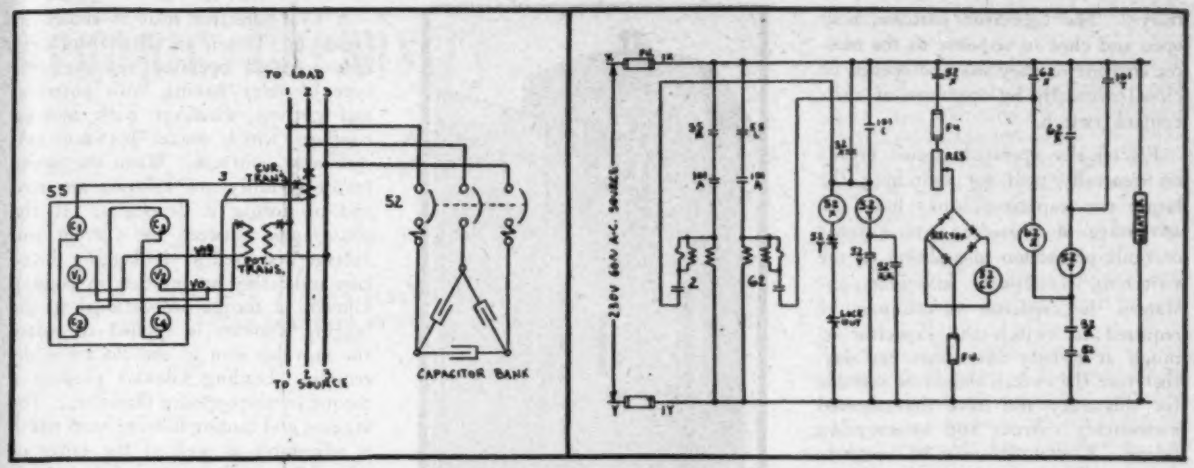


Fig. 7—Schematic diagram of a typical single step kvar control with Rectox solenoid operated circuit breaker. Key: 2, 61—Time delay relay; 52—Circuit breaker; 52a—Bkr. aux. sw. closes when bkr. closes; 52b—Bkr. aux. sw. opens when bkr. closes; 52aa—Cutoff sw. closes in operated pos. of mech.; 52cc—Bkr. closing coil; 52T—Bkr. trip coil; 52X—Type "30 F2" control relay; 52Y—Type "SG" cutoff relay; 55—LRKVA relay—R = Raise, L = Lower; 68-X Aux. tripping relay—Type "SG"; 101—Bkr. cont. sw. C = Close, T = Trip, O = Off, M = Manual, A = Automatic, "A" is closed when handle is pulled out. "M" is closed in normal position of handle. . . . All devices are shown de-energized. Phase rotation 1-2-3. Control sw. contacts "Make" in pos. indicated.

capacitors to be switched independently of load. If the capacitors are connected to a well regulated bus the voltage regulators or other devices will usually keep the voltage within satisfactory limits independently of the amount of capacitors applied. Circuit voltage therefore does not necessarily reflect the need for capacitors and if capacitors are to be switched other methods of detecting their requirements should be used.

For example, if sufficient capacitors are added to supply the lagging kvar at full load it may be desirable to switch them with variations in load to reduce the demand and losses or avoid a penalty because of excessive leading power factor at light load. Sometime capacitors are installed so that regulating equipment can maintain a satisfactory voltage level at full load. In such cases the capacitors usually should be removed at light load in response to kvar control or current control so that the regulator will be operating under the best conditions to keep the voltage within satisfactory limits.

The choice between current and kvar control depends upon the relationship of load power factor to variation in kilowatt loading, the number of switching steps required and the existing physical circuit arrangement. In cases where either type of control can be used the physical arrangement of the circuit and the availability and location of instrument transformers will dictate the type of control to be selected. The current control master element should receive its signal from a current transformer located on the load side of the capacitor to measure the uncorrected load whereas the current transformer for signaling the current element of the kvar relay should be located on the supply side of the capacitor.

Where the voltage is well regulated and the load power factor remains substantially constant with variation in kilowatt loading the current control scheme shown in the center of Figure 1 is usually used.

On circuits where the voltage is well regulated and the load power factor varies in an unpredictable manner with variation in kilowatt loading the kvar control shown in schematic form at the right in Figure 1 gives the best results.

Figure 4 illustrates graphically how the kvar demand was kept within desired limits at an industrial plant where it was desired to improve the full load power factor from 70 per cent to 97 per cent lagging. In this case the load power factor was expected to vary in an unpredictable manner between 60 per cent and 80 per cent for load variations between ¼ and full load.

By adding sufficient capacitor kilovars to improve the power factor from 70 to 98½ per cent and having about ⅓ fixed with the remaining divided into two steps about ⅓ each of kvar demand was kept within desired limits.

III Necessary Components

The automatically switched capacitor installation consists of the capacitor, the capacitor switch, the automatic control, instrument transformers and control source.

These components can be assembled in combinations that will meet almost any operating requirement. Rack type capacitor units are available for either indoor or outdoor service. The capacitor switch and automatic control may be assembled in the capacitor housing or the capacitor switch and the control may be mounted separately from the capacitor. If it is desirable to have the control elements at some central location, the automatic control assembled in a cabinet can be mounted separately from the capacitor or capacitor switch. This latter arrangement is often used with indoor multiple units dust-tight capacitor assemblies and outdoor hanger type capacitor units mounted on poles.

The automatic control which receives and interprets the signal and acts to perform the desired function consists of a master relay, time delay relays, auxiliary devices and a control switch. A voltage sensitive relay, a current sensitive relay or a kilovar sensitive relay is the master element. It receives and interprets the signal and initiates the switching operations after a time delay sufficient to prevent unnecessary switching operations caused by momentary disturbances on the power circuit. The time delay usually is not critical but in the interest of keeping the transient inrush current to a minimum, enough delay is inserted between the opening and closing of the capacitor switch to permit the discharge devices to drain off a substantial part of the stored energy. Auxiliary relays respond to the request of the master element and time delay relay to close or open the capacitor switch and handle the heavier control currents that should not be handled by the sensitive control

relays. The capacitor switches may open and close in response to the master element or they may be opened or closed manually by operation of their control switch.

Electrically operated circuit breakers generally used for switching the larger size capacitor banks have the advantage of providing over-current or fault protection in addition to the switching function. In some instances the capacitor switch may be required to switch the capacitor as much as twenty-five times per day, therefore the switch should be suitable for this duty and have the required momentary current and interrupting rating. Contactors may be adequate for small, low-voltage capacitors where the fault current or momentary inrush current does not exceed the maximum rating of the contactor. Oil immersed contactors may be used on small medium-voltage capacitors for distribution circuits on a similar basis.

The voltage sensitive relay for voltage control as illustrated at the left of Figure 1 should receive its signal from a potential transformer located at the point where the voltage is to be controlled which may be on either side of the capacitor location. The current control master element should receive its signal from a current transformer located on the load side of the capacitor to measure the uncorrected load current as illustrated in the center diagram of Figure 1. The kvar control necessitates measuring the combination of both current and voltage and it is usually desired to measure the corrected load current. The current element of the master relay therefore should receive its signal from a current transformer located on the supply side of the capacitor as shown in the right-hand diagram of Figure 1. The voltage element can receive its signal from a potential transformer located on either side of the capacitor.

"Range of adjustment" and "Band width" must be given proper consideration on all regulating types of master elements. "Range of adjustment" is considered as the normal operating level of the divice and it allows for the differences encountered in operating conditions. The "band width" is the difference between pick-up (contact closes to switch a capacitor on) and drop-out (contact closes to switch capacitor off). This band width must be larger than the signal change caused by switching the capacitor to prevent "pumping." For illustration, it might be pointed out that one of the conventional voltage regulating relays has a range of adjustment from 90 to 110 per cent of its normal rating of 115 volts. The band width of this relay is adjustable from 3 to 7.5 per cent of its normal rating.

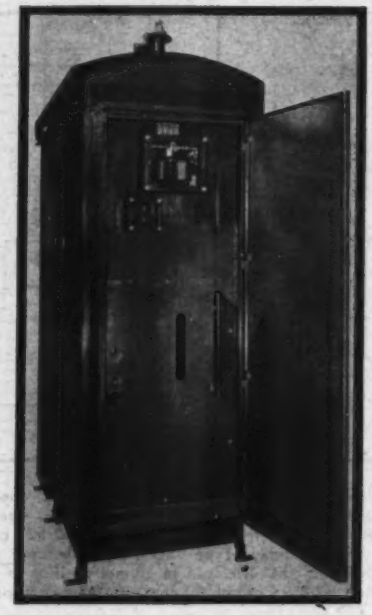


Fig. 8—Single step kvar control panel enclosed in outdoor capacitor rack showing kvar relay, two element time delay relay, and control switch.

Figure 5 shows a simple voltage sensitive relay which is used to initiate the opening or closing of the capacitor switch in response to a change in circuit voltage. This is an alternating current, solenoid operated moving arm type of relay with moving contacts which travel between two stationary contacts with a permanent magnet for adjusting band width. The voltage range is adjustable by shifting the weight along the moving arm. The band width is adjustable by changing the position of the permanent magnet. The permanent magnet also provides quick "make" and quick "break" of the relay "contacts." This type voltage regulating relay is suitable for either single step or multistep automatic control for switching capacitors and has also been used on many feeder voltage regulators.

The current sensitive relay is similar to the voltage relay except it is equipped with an auxiliary transformer with taps to obtain wide range of adjustment. This transformer saturates to limit the voltage on the relay coil. A current relay is suitable for single step control only. If more than one switching step is desired, a separate current control is required for each capacitor switch. In this case the current sensitive relays should be adjusted for different current values to permit sequence switching operations.

A kvar sensitive relay is shown in Figure 6. This is an alternating current solenoid operated moving arm type of relay having both potential and current windings with moving contacts which travel between two stationary contacts. When the power factor is unity the kilovars are zero and no torque is developed. If the phase angle between the current and voltage is shifted in the lagging direction indicating an increase in lagging kilovars, a torque proportional to the lagging kilovars is applied to rotate the movable arm in the clockwise direction. Leading kilovars produce a torque in the opposite direction. The lagging and leading kilovar band width is adjustable as well as the range of adjustment. Permanent magnets are used to obtain quick "make" and quick "break" of the relay contacts. This relay is suitable for either single step or multistep automatic control for switching capacitors.

In the control circuits a certain amount of time delay is desirable to prevent unnecessary switching operations. This delay is obtained by a relay like that shown in Figure 7 as device 2 and 62. This two-element, thermal-type, time-delay relay times both the closing and opening of the capacitor switch. The thermal elements are connected together with an insulating means to compensate for variation in ambient temperature to hold timing constant for a given relay setting.

A typical diagram illustrating single step kvar control with Rectox solenoid operated circuit breaker is illustrated in Figure 7. Figure 8 shows the control relays mounted on a control panel which is enclosed in the capacitor housing. If the control switch is in the automatic position and one set of the master elements contacts close, indicating that capacitor kvar is required this will energize the closing element of the time delay relay. If the initial cause is not a temporary disturbance, then the master element contacts will remain closed until the time delay contacts have closed energizing the closing mechanism of the capacitor switch. The capacitor switch will then close and connect the capacitor to the circuit.

If with the capacitor connected to the circuit one set of the master element contacts close, indicating that the capacitor correction should be removed, this energizes the tripping element of the time delay relay. If the master element contacts remain closed for the time required for the time delay tripping contacts to close, then the capacitor switch tripping de-

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Organic Chemistry in Papermaking

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▶▶▶ THE GREAT ORGANIC raw material of the paper industry is cellulose. That, of course, is axiomatic and requires little further comment. If we except inorganic substances like asbestos, every papermaking fiber contains cellulose and nearly all of them retain some of the related hemicelluloses. The outstanding organic waste product of the industry is lignin. That, too, is well known.

What of the other organic compounds that enter the paper mill, the natural products and the synthetics? Have they any importance? How extensive are their uses? Where and why are they utilized?

These substances form the basis of our discussion, which makes no claim to give detailed information, but which seeks to give a general survey showing the intimate relationship between industrial organic chemistry and the sixth largest industry of the United States. My hope is that this article will present a somewhat new point of view—possibly an unorthodox one from the standpoint of the papermaker. The reader will find little more than an integrating skeletal outline for, whenever possible, he will be referred to comprehensive publications, especially to those that have appeared previously in THE PAPER INDUSTRY AND PAPER WORLD. Furthermore, some of the chemicals, their uses and properties may be found in the *Paper and Pulp Mill Catalogue* (Engineering Handbook) for 1945-6.

The surface active organic compounds

In a stimulating article, Miskel (*1*) refers to three types of surface-active agents which modify the various interfaces as they take place in papermaking. Cellulose, in its conversion into paper, requires water, and these surface-active agents change or modify the surfaces on which they concentrate, by virtue of their own behavior towards water. Such modifications are noted in the case of processes involving wetting, emulsification, dispersion, washing, capillarity, flocculation, deflocculation, defoaming, water repellency, etc., all of which occur in the art of papermaking. The reactivities of these surface active substances depend upon their molecular makeup. A part of the molecule is hydrophylic (*i.e.*, it has an affinity for water and tends to dissolve in water). Another part of the molecule is hydrophobic (*i.e.*, it repels water and, therefore, tends towards water insolubility). There is a balance between these two properties—like the opposing natures of Dr. Jekyl and Mr. Hyde within a single individual.

The three broad classes of surface active agents given by Miskel are (*a*) the "anionic," in which the negative part of the molecule is hydrophobic; (*b*) the "cationic," in which the positively charged portion is hydrophobic; and (*c*) those agents which are not ionized.

Under (*a*) Miskel includes the soaps of the resin and fatty acids. The rosin soaps are, of course, essential ingredients of internal (engine) sizing of paper. They are formed from rosin, the product of slash and longleaf pines of the Deep South. When this rosin is obtained by wounding the living pine tree, it is termed *gum rosin*. When it is obtained by extraction of pine stumps or "lightwood," it is christened *wood rosin*. In either case, it is largely a mixture of related resin acids ($C_{20}H_{30}O_2$), with abietic acid as the main component of the commercial product. This makes abietic acid one of the most abundant of the natural acids. The fact that abietic acid is saponified with soda ash or caustic soda solutions to form sodium abietate (*alias* rosin soap) permits its use in rosin size. Georgi (*2*) claims that abietic acid forms a double sodium salt, and it is thought that free rosin size contains a complex in which three molecules of free abietic acid and one molecule of sodium abietate are present.

Another important group of surface-active agents (included under (*a*)) are the salts of mixed fatty acids—the ordinary soaps of commerce. These are widely used as detergents (in washing felts), as die lubricants in die-formed paper products (like drinking cups), and in the preparation of various emulsions. Furthermore, special water-insoluble soaps (like aluminum stearate) can be used to lend water repellancy to paper products. Insoluble soaps have been found serviceable as hot melt paper coatings and in vaporproof coatings. The use of soaps in papermaking has been reviewed by Leffingwell and Radin (*2a*).

Under classification (*a*), Miskel also includes the following: the sulphated oils and esters (*e.g.*, sulphated castor oil) which have been applied in the paper industry as plasticizers, and as softening and defoaming agents; aliphatic alcohol sulphates (which have been used in accelerating broke and rag beating operations, and as wetting agents and detergents); napthene sulphonates (used as detergents in felt washing, emulsifiers, and wetting agents); and various other sulphates, sulphonates, and amino derivatives that are beyond the scope of this article. Various of the above compounds serve as detergents and dispersing agents in the deinking of paper.

Cationic agents of class (*b*) include alkyl amines and their salts, and the so-called quaternary ammonium salts. The latter are effective germicides, in which capacity they will be referred to later. They can also be used in sizing with latex and as wetting agents for basic dyestuffs.

The nonionic agents [class (*c*)] include polyhydroxyalcohol esters, polymers of ethylene oxide, and polyvinyl alcohol. These find uses as dispersing agents and deflocculents, which, because of their nature, can be used in neutral, alkaline, or acid solutions and which can be applied in special coating compositions and sizes. The polyvinyl alcohols give rise to grease-, oil-, and water-resistant films. Miskel's article includes a good bibliography and deserves study.

The organic fungicides and bactericides

A number of interesting organic compounds have aided in the good housekeeping of the mill. Often these have served effectively in controlling the growth of slime—one of the bugaboos of the papermaker. Of course, chlorine and chloramine are excellent disinfectants, but we are concerned

at present only with organic compounds. These, if introduced into the beater, the whitewater system, or elsewhere in the wet end of the papermaking operation, can supplement or even replace chlorine. Some, it is claimed, have a wider usefulness in that they prevent stain and rot in pulp logs, preserve lap pulp, extend the life of felts, and make papers mold resistant.

An important disinfectant is sodium pentachlorophenate (sold under the various trade names of Sanobrite, Nalco 21, and Dowicide G). There are several Dowicides which, if they are followed by a letter, are sodium salts and, if followed by a number, are the free phenol. These include "Dowicide A" (sodium *o*-phenylphenate), "C" (sodium 2-chloro-*o*-phenylphenate), and "F" (sodium 2, 4, 5, 6-tetrachlorophenate). Under certain conditions mixtures are used. For example, "Nalco 23" is a mixture of Dowicides C and G. If algae are to be controlled, "Nalco 25" (a mixture of a copper salt and a chlorophenate) is indicated. In general, the sodium salts of the chlorinated phenols are water-soluble. The free phenols, however, are insoluble. At times it may be desirable to fix the free phenol in the paper sheet. This can be done by adding the soluble salt to the beater, and then adding the alum, the acidity of which liberates the phenol and brings it into intimate contact with the fiber by which it is retained. Thus, the sequence of addition of the chemicals to the beater may be of importance.

Another important disinfectant is phenyl mercuric acetate (commercially known as Merfenel, P.M. 32, and Mersolite). A third slime controller is ethyl mercuric phosphate (Lignosan).

The Nalco products serve in the general disinfection of the mill system and aid in the production of papers low in bacterial content such as milk bottle caps, paper milk containers, bread wraps, sanitary tissues, *et al.*

When mildewproofing is desired, special organic compounds have been suggested. These are introduced into the sheet in the dryer section or at the calenders. There is an entire series of quaternary ammonium compounds (detergents) which are grouped together under the trade name "Roccal." These have the more formidable scientific family name of alkyl dimethylbenzylammonium chloride. Another mildew inhibitor is 8-hydroxyquinoline sulphate. In packaging dairy products, the sodium and calcium propionates are used in protective wrappers. In citrus fruit wraps, the organic compound, diphenyl, has been introduced recently to prevent mold.

An excellent review of the importance of disinfectants in the industry has been given by Appling (*3*).

The Dyestuffs

In view of a series of comprehensive articles on the classification and properties of dyestuffs and pigments by Laughlin (*4*), detailed consideration of these important compounds becomes unnecessary. There are three classes of organic dyes that come to the papermaker: the basic, acid, and direct dyes, all of which have been described ably by Laughlin. Since the appearance of Laughlin's series, Lips (*5*) has described the dyeing of paper with naphthanils, with sulphur colors, and with vat colors. Naphthanils are azoic dyes. They form azo dyestuffs directly on the fiber and have only recently been applied to paper. Although a nearly complete range of shades is obtainable, the oranges, reds, and yellows are the bright ones that characterize this group of dyestuffs. These colors may be used in dyeing twisted papers (used in paper sacks), paper rugs, etc.

Thanks again to Laughlin (*6*), the organic sulphur colors (whose constitution is still unknown) now can be applied to paper without liberating an offensive odor of hydrogen sulphide. The dyes are introduced into the beater in a solution reduced with sodium sulphide. Heavy metal salts like zinc chloride and copper sulphate kill the odor completely, and also serve to neutralize the alkalinity—all in one step. The sulphur dyes seem well suited for "granite" fibers and for giving various blacks and browns.

Vat colors are extremely light fast. They are also very bright and very insoluble in water. They are also generally fast to such reagents as chlorine, acids, and alkalies. The color is applied in the warmed beater by forming a solution of an alkaline hydrosulphite. This nearly colorless reduction product is taken up by the pulp and is then oxidized by the action of the air to the desired vat color. After the color formation is complete, the excess alkalinity may be neutralized by alum or niter cake, and the sheet can be sized in the usual manner. Vat dyes are recommended only for special papers, requiring a very high degree of light fastness.

The naphthil, sulphur, and vat dyes have been mentioned specifically, not because of any outstanding importance, but because they are newcomers to the paper mill and because their application to paper is not generally known.

The proteins

These are substances derived from natural sources. They invariably contain carbon, hydrogen, nitrogen, and oxygen, usually sulphur and, at times, other elements as well. When hydrolyzed, they yield mixtures of amino acids.

Casein. Among the adhesives used to retain mineral components and pigments on the surface of paper (*i.e.*, in coated papers), casein holds a dominant position. It has been estimated that, of all the casein manufactured, about 75 per cent enters the paper industry (*7*). The cream-colored phosphoprotein, casein, is obtained by flocculating skimmed milk with acid. It is then washed, dried, and ground. In mill practice it is used in solutions made alkaline with ammonia, caustic, borax, soda ash, di- and trisodium phosphates or, more often, by using combinations of the alkaline solutions.

Glue. This also is used extensively as a coating adhesive and contains largely protein, together with certain protein degradation products. It is extracted from animal tissues (hide or bone) by treatment with limewater, followed by neutralization, washing and, eventually, by heating with water. The aqueous extracts are then concentrated, chilled, and dried (*8*).

Albumin. This is obtained from eggs or from blood, and finds a limited use in a few specialty papers.

Zein. This by-product, obtained in the processing of corn, is an alcohol-soluble protein. Commercially, it may be extracted from gluten meal with dilute isopropyl alcohol. Zein, which is compatible with various resins, has been suggested for use in paper coatings, adhesives, and in laminated board. Zein may be "cured" by formaldehyde or formamide (*8a*).

Soybean protein. Within the past 7 years, the soybean proteins have found their niche in the paper industry. Prosize, which contains rosin size and soybean protein, was patented in 1938 (*9*). Since then, various investigators have shown the feasibility of using these proteins in glossy coated papers, in washable wall papers, etc. The claim has been made that, among the casein substitutes, the alpha protein from soybean is one of the best all-round materials (*10-12*).

Oat flour antioxidant. Wrapped fatty foodstuffs of certain types are very subject to oxidation and concomitant rancidity. In packaging such foods, it has been proposed to incorporate an antioxidant into the paper wrap; the one that has received most

attention is oat flour. Just which component of the flour is responsible for its antioxidizing action is not revealed, and quite arbitrarily we have included it under the general head of the "proteins." The flour may be applied as a surface sizing. In the case of parchment, greaseproof, or glassine papers, the sizing is carried out in the tub; with board, it may be introduced at the calender stacks. The claim is made that such paper can be paraffined or waxed as usual without losing its antioxygenic effects. The flour may also be mixed directly with paraffin in the manufacture of paper milk bottles (*13-14*). In many articles of foodstuffs, other antioxidants have been reported. However, if any of these have been incorporated into paper, they have received little mention in the literature.

Woolen felts. Two other protein-containing materials which find wide use in the paper mill are seldom thought of in terms of "protein." They are the *leather* used in belting, and the *wool* so extensively used in papermaking felts. In the care of felt, its composition must be kept in mind constantly. Wool proteins are dissolved by alkalies, and so alkaline soaps are taboo. Special, nearly neutral detergents are advocated. Proteins are also attacked by acids. Therefore, these must be scrupulously avoided. Inasmuch as proteins are attacked by microorganisms, the inroads of bacteria must be guarded against. Appling (*3*) cites the following instance: "A board mill had the experience some ten years ago of replacing pickup felts by new ones on Thursday, operating 48 hours, closing down over the weekend, and attempting to start with the same felt on Monday, only to find that the felt was useless. Wool-decomposing bacteria had been at work." Other equally dramatic attacks on felt life could be cited (*15*). It is here that organic bactericides are important. Felts must also be protected against moths. This can be accomplished by the use of naphthalene or other organic mothproofing chemicals.

The Starches

The starches are widely used in the paper industry. Of these, cornstarch appears dominant in our wartime economy, with a small amount of wheat starch finding its way into quality papers. Before the war, tapioca starch was also widely used in the United States. In Europe, prior to the war, potato starch (which is relatively expensive commodity in our country) also found extensive use. Cornstarch figures for 1944 (*16*) indicate that over 100 million pounds were used as adhesive in the fiberboard and shipping container industry. Over 200 million pounds were utilized in the sizing, finishing and fabrication of paper and paper products. These statements are made in refutation of a widely quoted authority, who states that "starch is not much used in papermaking" (*17*). Not only is starch used as such, but chemically modified starch (*i.e.*, starch treated with chlorine or with enzymes) finds wide utilization. Often starch mixtures are introduced at the wet end of the papermaking operation—frequently after the stock leaves the jordans. On the other hand, starch solutions are very frequently used in tub sizing, and after such use the sheet often shows markedly advantageous properties. In general, the bursting strength increases, as does the folding endurance (especially in the machine direction). Often the change in tear is not very great, and often, too, the air permeability decreases. However, it is not possible to generalize, other than to say that, by the judicious use of starch, the strength of the sheet is increased. The reader is referred to two very good papers by Casey (*18*) on the use and retention of starch in paper manufacture, and to a bibliographic article (with 147 references) by Smith and Hamilton (*19*).

The Endosperm Mucilages

Before the war, certain imported mucilages had a limited use in the paper industry. These aided materially in improving paper strength and sheet formation. One of these was locust bean gum, the unavailability of which led to a search for other mucilages that could be milled and which would serve as substitutes. A number of these are gradually gaining acceptance —and they, like locust bean gum, are all related chemically in that they are mannogalactans. This means that, on acid treatment, they give the two sugars, mannose and galactose, which are also obtained from the locust bean. Their fabrication is one of the interesting recent developments, of which more will probably be heard in the future.

The synthetic resins

Two general divisions may be made in considering the synthetic resins: (*a*) the thermosetting resins which, on heating, are chemically changed and give insoluble, practically infusible polymerized products, and (*b*) the thermoplastic resins, which soften on heating and harden again when they are cooled. Under (*a*), we have the phenolics, and the urea and melamine resins. Under (*b*) come the cellulose esters and ethers, and the polystyrene, polyvinyl, vinylidene chloride, and the acrylate resins, and others. Thermosetting resins are employed as surface coatings and as adhesives. Combined with various fillers (like paper sheets and cotton fabrics), they are used in the production of laminates. With alpha pulp, wood flour, etc., they are employed in the production of molding compounds. The thermosetting resins have many remarkable structural applications, and the war has seen some unusual developments in this field, where exceptional strength has been obtained especially in paper used in the manufacture of piping, tables, cabinets, and in airplane parts. An important phenolic resin development in the paper industry is their use in the manufacture of bearings on calenders, press rolls, and in beaters. They permit water lubrication in place of oil, and they also appear to prevent slime accumulation (*20*). Urea and melamine resins are also used extensively in the improvement of wet strength in paper used for maps, bags, wiping tissues, towels, etc. Thermoplastics are not generally used with cellulose fillers. The paper industry, however, uses such resins for paper surfacing, heat sealing, and adhesives. The thermoplastics do not find uses as structural materials. It is interesting to note that cellulose (alpha pulp) is the raw material for the production of cellulose ethers and esters—which are themselves thermoplastics.

The growing importance of the plastics in the paper industry deserves far more than the cavalier treatment that they have received here. For amplified discussions, the reader is referred to a few of the many excellent articles that have appeared in the recent literature (*21-30*).

Glycerin

This polyhydric alcohol is widely used in paper converting. It is hygroscopic and has softening and plasticizing properties that lend flexibility to an otherwise brittle sheet. Over 2.7 million pounds of glycerin are used annually in glassine, greaseproof, and vegetable parchment papers. About 1.8 million pounds find other uses in paper (*31*). Combined with litharge, glycerin is still widely used in the sulphite mill in the lining of digesters.

Papers of high wet strength use alkyd resins, which are made by condensing glycerin with phthalic anhydride (or other similar acids). Resins of this type have also been used for glazing paper, for rendering paper greaseproof and waterproof, and even

as a binder in carborundum papers. Its uses are reviewed in an excellent article by Leffingwell and Lesser (32), together with an extensive bibliography. These same authors have given thorough accounts of the use of glycerin in paper conversion (33).

Substitutes for glycerin have been suggested and used to a limited extent. Most of these, like glycerin, are aliphatic compounds containing more than one hydroxyl group. They include glucose, ethylene glycol, pentamethylene glycol, sorbitol, and mannitol. Ethanolamine and lactic acid have also been under experiment (34). Invert sugar (a mixture of glucose and fructose obtained by hydrolysis of cane sugar) has also found a use as plasticizer. The best method for applying the latter (35) is by means of a size press or size tub. Application in the beater has not proved effective.

The waxes

Strictly speaking, the waxes are natural esters formed from complex alcohols like the sterols or higher aliphatic alcohols with aliphatic acids of relatively high molecular weight. They may also contain an excess of the alcohol together with some paraffin hydrocarbons. In industry, however, the term "wax" is more elastic and may include mixtures of wax-like consistency and with wax-like properties, such as paraffin, etc.

The waxes are introduced into coating mixtures in the form of emulsions, obtained by the use of borax, soaps, caustic soda, and soda ash. They give gloss or polish to the coated paper through the action of the flint machine or friction calender. The substances used include carnauba wax and beeswax (which are largely complex myricyl esters), some stearic acid, and such "mineral" waxes as ceresin and paraffin. The two latter are hydrocarbons. Paraffin is used to a great extent in waxed papers. It is a mixture of saturated hydrocarbons ($C_{22}H_{46}$ to $C_{28}H_{72}$), and a refined product is employed.

In engine sizing, the water resistance of certain waxes is exploited. Here the waxes are added to the beater in emulsified form; they include the paraffin waxes (crystalline and amorphous), carnauba wax, and petroleum asphalt. Montan wax (a very hard mixture of hydrocarbons, organic acids and esters derived from lignite) is also used. There is no reason why other waxes, if available or inexpensive, could not be used as well.

The hydrocarbons (other than waxes)

"Pitch," one of the headaches of the papermaker, may find its way into the paper-machine wire. A method of removing it involves scrubbing with gasoline or kerosene (both of which are mixtures largely of aliphatic hydrocarbons). Kerosene is also used as a foam killer. Pine oil (which contains some terpene hydrocarbons, but largely oxygen derivatives of these terpenes) also serves to prevent foam on the machine. The hydrocarbon, naphthalene, is used in preventing moth attack on dryer felts. Benzene has a limited use in the paper industry. It serves as an ingredient in special adhesives, and as a solvent for transfers.

Among the hydrocarbon mixtures that prove useful to the paper industry, the lubricating oils should certainly be included. Without them, the mill would function inefficiently or not at all. The oils are petroleum products, very complex in nature, which (in the case of Oklahoma oils) contain 18-26 per cent of straight and branched chain hydrocarbons, 43-51 per cent of cycloparaffin hydrocarbons (the naphthenes) and about 23 per cent of hydrocarbons made up of both naphthenes and aromatic rings, together with about 8 per cent of asphaltic substances. The refining of lubricating oils to improve their properties is described briefly by Fieser and Fieser (36), who also discuss antioxidants that prevent sludging. Greases, used in lubrication, are solid or semisolid gels of lubricating oils to which varying amounts of soluble metallic soaps (like calcium stearate or aluminum naphthenate) have been added.

Rubber. It is obvious that rubber finds many uses in the industry. Hoses, belting, deckle straps, roll-coverings all require rubber, which may also find its way into other parts of the paper machine—*e.g.*, aprons, suction box covers, etc. Thus hundreds of tons of rubber are required annually.

An interesting development in the industry before the war was the use of rubber latex as a paper saturant. Artificial leather was used in the manufacture of certain shoes, and in their production natural rubber latex was the binding agent for felted paper. Furthermore, the production of tough, resilient and flexible papers was also attained by mixing hydrated pulp with latex, and by careful control of the *p*H to obtain a stable dispersion of the rubber prior to flocculation.

With the scarcity of natural rubber, manufacturers scouted around for other elastomers; among those recently investigated was synthetic Buna S latex (now termed GR-S latex). Papers saturated with GR-S offered certain advantages over resin-treated sheets. On the other hand, their production presented greater difficulties than that of natural rubber nor do they have all the highly satisfactory properties of the latter. Nazzaro (37) has listed the advantages and disadvantages of Buna S latex, and the former seem to outweigh the latter. It is quite possible that some of the present-day drawbacks of GR-S will be removed by future research.

Asphalt. This is the bituminous, semisolid viscous black product resulting from the partial oxidation of the higher fractions of certain petroleums. The lighter hydrocarbons are lost by evaporation, and the higher fractions are chemically changed. Asphalts occur in Trinidad, Venezuela, near the Dead Sea, and elsewhere. Their use in the manufacture of roofing papers is well known. Recently bituminous emulsions for use in sizing laminated, waterproof containers have received renewed attention because of the fabrication of weatherproof boards and boxes during our war economy. Bituminous emulsions have also been suggested and used, as low-cost extenders for more expensive adhesives (38-39).

The foregoing survey is not all-inclusive, nor is that its object. It seeks to show that other great industries involving petroleum, naval stores, soaps, dairy products, textiles, rubber, starches, and sugars, etc., effectively serve the paper industry, which is simply another way of saying that the industrial organic chemist co-operates actively and effectively with the papermaker.

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Shunt Capacitors

(Continued from page 888)

vice will be energized opening the capacitor switch and disconnecting the capacitor from the circuit.

The multistep control operates in a manner similar to a single step control except it is arranged to switch two or more groups of capacitors selectively and automatically by means of relays.

IV Determination of Capacitor Kvar Steps

If it is found that the capacitors should be automatically switched the following steps are recommended in selecting the size and number of switching steps:

(a) Determine the maximum capacitor kvar permitted during light load condition without exceeding the upper voltage limits, to maintain desired power factor or to keep the reactive kvar demand within desired limits.

(b) Next determine the maximum capacitor kvar that can be switched in one operation without exceeding the permissible voltage limits, kvar demand or change in power factor.

(c) The difference between the total capacitor kvar installed and the capacitor permitted during light load determines the total capacitor kvar to be switched.

(d) The minimum number of switching steps is the ratio of the total capacitor kvar to be switched to the maximum capacitor kvar that can be switched in one operation without exceeding permissible limits.

For practical purposes the voltage drop can be determined from the kilowatt load component flowing through the resistance of the circuit plus the kilovar component flowing through the reactance of the circuit. The voltage rise produced by the capacitor is the product of the circuit reactance ohms and the change in kilovar load amperes provided by the capacitor. When calculating voltage rise produced by the capacitor above an existing voltage level, the nonlinear variation of exciting kilovars drawn by motors, transformers, etc., should be given due consideration. If the voltage level is high, the exciting kilovars load may increase rapidly with small increase in voltage and should be taken into account in arriving at the netkilovars. It should be also kept in mind that the capacitor kvar varies as the square of the voltage for a given rating. If the voltage level is moderate and steps are taken to permit only a small change in voltage, the nonlinear variation of exciting kilovars may be of no consequence and may be disregarded. If this is the case, the voltage rise produced by the capacitor is the product of the circuit reactance ohms and the capacitor current.

$$\text{Per cent Voltage Rise produced by Capacitor} = \frac{\text{Capacitor kvar} \times \text{circuit Reactance in ohms}}{10 \times (\text{line kilov.})^2}$$

Not only are capacitors applied to improve circuit voltage, increase system capacity, reduce kvar demand and improve power factor but they are also used to reduce power costs. In the final analysis the capacitors are chosen because they are more economical than other methods of obtaining the desired improvements in circuit performance or reduction in power costs.

Vapor Seals for House Walls

The investigation at the National Bureau of Standards of vapor barriers for walls of houses has been extended to an investigation of the possibilities of combining vapor resistance with decorative features in interior finish to provide barriers that would be continuously accessible for inspection and reduce fire hazards.

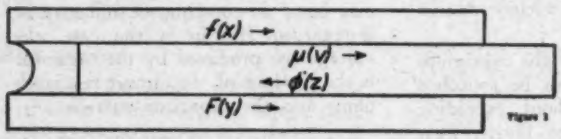
Samples of wall papers applied in the conventional manner allowed 1400 grams of moisture per square meter per day to pass through the wall while samples of the same paper applied with a vapor-resistant adhesive reduced the passage of moisture vapor 100 fold. Samples of wall papers having a vapor-resistant coating on the face of the wall paper and applied in the conventional manner also reduced the passage of moisture vapor by 100 fold. Unfortunately, no vapor-resistant adhesive or coating has been found that does not disfigure wall paper. Vapor-resistant plastic sheetings though difficult to apply were found very satisfactory otherwise. Paint films and varnishes with and without metal powders were easy to apply but gave variable results. Good aluminum, copper and other metal foils were in most cases impervious to moisture vapor. Hence, particular attention is being given the possible use of foil on the interior surfaces as a base for decorative finishes.

Design of Special Slide Rules For Paper Mill Calculations

D. S. DAVIS
Wyandotte Chemicals Corporation

▶▶▶ MANY CALCULATIONS bearing directly on technical control work in the paper mill can be handled most conveniently by special single-purpose slide rules. These may be constructed of file-folder or paperboard stock, as previously described (*2*) or, for best result, recourse may be made to wooden slide rule blanks, readily obtained (*6*).

Detailed designs of slide rules for calculating paper machine production (*3*), roll length (*5*), and stock losses (*4*) have been presented. All were based on the arrangement of scales by means of inspection or trial with paper models. Such methods are entirely adequate yet many find this technique somewhat confusing and would prefer to follow a set of simple rules.



Austin (*1*) has given an excellent discussion of the theory and construction of special single-purpose slide rules designed to solve several familiar chemical engineering equations. The forms covered include the single slide which handles four variables, the double slide for six variables, and the middle support, ideal for even more variables or for solving two equations simultaneously.

The present discussion will be confined to suggesting simple rules for designing the common four-variable multiplication and division types, and to illustrating how they may be applied to the preparation of three slide rules of interest to paper chemists and engineers. Let $f(x)$, $F(y)$, $\phi(z)$, and $\mu(v)$ be functions of the variables x, y, z, and v, respectively, and consider the following four rules:

1. Write the equation

$$f(x) = F(y) \cdot \phi(z) \cdot \mu(v)$$

in the logarithmic form,

$$-\log f(x) + \log F(y) + \log \phi(z) + \log \mu(v) = 0$$

2. The frame and slide are called members. If two functions have the same sign in the second form of the equation and are to appear on the same member they must increase in opposite directions; conversely, when they bear opposite signs they must increase in the same direction. Thus, if $\phi(z)$ and $\mu(v)$ are to appear on the slide (Figure 1) they must increase in opposite directions since the signs of their terms are the same.

3. When functions appearing on adjacent scales have the *same* sign they must increase in *opposite* directions; conversely, when they bear *opposite* signs they must increase in the *same* direction. Thus, if $\mu(v)$ and $f(x)$ are to appear on adjacent scales they must increase in the same direction since they bear opposite signs. $F(y)$ and $\phi(z)$ are adjacent and increase in opposite directions since they have the same sign.

4. The scales on the frame are usually centered. One of the scales on the slide may be placed at will but the other must be located in a position such as to satisfy the equation.

Paper Machine Production Rate

The rate of production of a paper machine, P, in pounds per hour, may be calculated from the equation

$$P = 0.001515\ B\ w\ v$$

where B = ream weight, in pounds (25" x 38", 500)
w = width of sheet, inches
and v = machine speed, feet per minute.

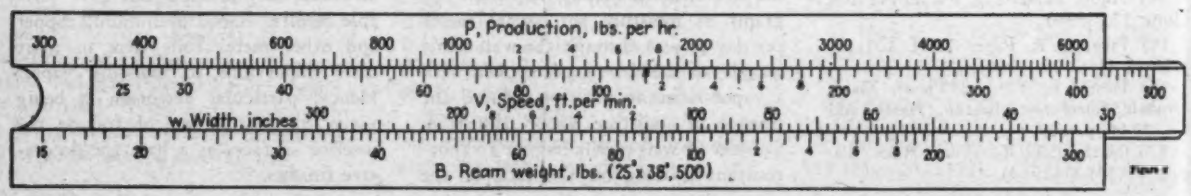
In effecting a design by following the rules write the equation as

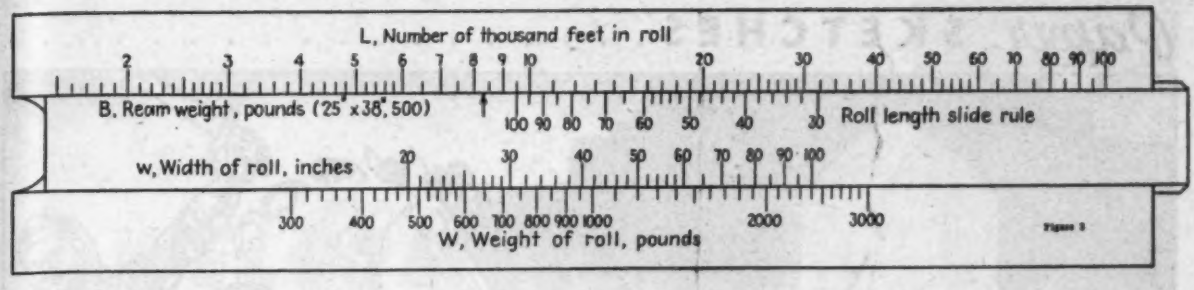
$$-\log P + \log 0.001515 + \log B + \log w + \log v = 0$$

The w and v functions are to appear on the slide and since they bear the same sign they will increase in opposite directions as required by Rule 2. The B and v functions appear on adjacent scales and since they have the same sign they increase in opposite directions as demanded by Rule 3. Further, the P and v functions bear opposite signs and are adjacent. Rule 3 requires them to increase in the same direction. The P and B functions appear on the frame and have opposite signs. By Rule 2 they increase in the same direction.

The P, v, and B scales are centered but the w scale is located so that it solves the equation. With the ranges of variables as shown in Figure 2, a suitable modulus (length of scale representing one unit in plotted function is 25 cm.

The scale lengthens then become $25 \log \frac{300}{15} = 32.53$ cm.; $25 \log \frac{300}{30} = 25$ cm.; $25 \log \frac{500}{25} = 32.53$ cm.; and $\log \frac{6000}{300} = 32.53$ cm. for the B, w, v, and P. scales, respectively.




L, Number of thousand feet in roll
B, Ream weight, pounds (25" x 38", 500)
Roll length slide rule
w, Width of roll, inches
W, Weight of roll, pounds

Roll Length

The length of paper, L, in thousands of feet, in a roll may be calculated by means of the equation

$$L = 39.58 \frac{W}{w\,B}$$

where W = net weight of paper in the roll, pounds
w = width of roll, inches
and B = ream weight of paper in pounds (25"x38", 500).

Applying the rules for design, write the equation as

$$-\log L + \log 39.58 + \log W - \log w - \log B = 0$$

The B and w functions are to appear on the slide and since they bear the same sign the scales for these functions are constructed to increase in opposite directions, by Rule 2. The L and B functions appear on adjacent scales and since they have the same sign they increase in opposite directions, by Rule 3. Further, the k and W functions bear opposite signs and are adjacent. Rule 3 requires that they increase in the same direction. Also, the L and W functions appear on the same member and since they bear opposite signs they increase in the same direction as required by Rule 2.

The L, w, and W scales are centered but the B scale is placed so that it satisfies the equation. With the ranges of variables shown in Figure 3, a suitable modulus is 12.5 cm.

The scale lengths are $12.5 \log \frac{100}{1.5} = 22.8$ cm.; $12.5 \log \frac{3000}{300} = 12.5$ cm.; $12.5 \log \frac{100}{20} = 8.8$ cm.; and $12.5 \log \frac{100}{30} = 6.5$ cm. for the L, W, w, and B scales, respectively.

Stock Loss

The stock loss, W, in pounds of air-dry fiber lost in the whitewater effluent per 24 hours, is given by the equation

$$W = 40\ b\ c\ h^{1.5}$$

where b = width of weir, in inches, over which the effluent passes
c = consistency, grams of oven-dry fiber per liter of whitewater
and h = head on the weir, inches.

Applying the rules for design, write the equation as

$$-\log W + \log 40 + \log b + \log c + 1.5 \log h = 0$$

The b and c functions are to appear on the slide and since they bear the same sign the scales for these functions are constructed to increase in opposite directions, by Rule 2. The W and c functions appear on adjacent scales and since they have opposite signs they increase in the same direction as required by Rule 3. Further, the b and h functions bear the same sign and are adjacent. Rule 3 requires that they increase in opposite directions. Also, the W and h functions appear on the frame and have opposite signs, hence, by Rule 2 they must increase in the same direction.

The W, c, and h scales are centered but the b scale is located so that it solves the equation. With the ranges of variables shown in Figure 4, a suitable modulus is 25 cm.

The scale lengths are $25 \log \frac{2000}{100} = 32.53$ cm.; $25 \log \frac{1.0}{0.1} = 25$ cm.; $25 \log \frac{40}{10} = 15.05$ cm.; and $1.5(25) \log \frac{3}{0.5} = 29.17$ cm. for the W, c, b, and h scales, respectively.

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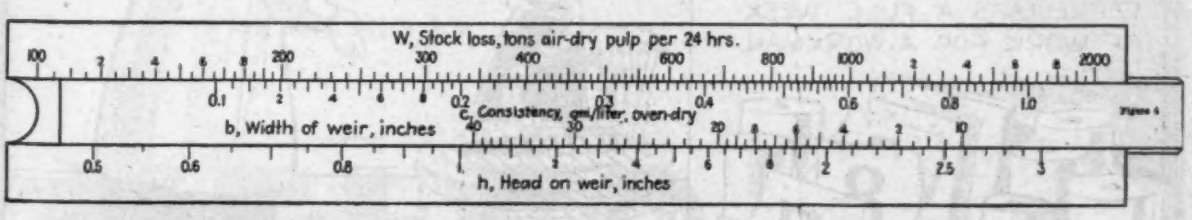
3) Davis, D. S., Paper Ind., 19, 298 (1937).
4) Davis, D. S., *ibid.*, 19, 431 (1937).
5) Davis, D. S., *ibid.*, 19, 940 (1937).
6) Roemer, L. H., 5712 Glengate Lane, Pleasant Ridge, Cincinnati, Ohio.



Laymen have been trained to think that the physicist or the chemist dives into nature . . . and comes up with something wonderful. That . . . is not true. The best we can do—indeed, the only thing that is worth doing—is, with infinite patience, to work out the laws of nature as they apply to this or that tiny section of matter and then find a way to direct the working of the natural law into a channel where it may serve mankind. That is why the end of every discovery must eventually be a commercial utility.—Willard H. Dow.

Paper SKETCHES . . . . . .

VALENCIA, SPANISH CENTER OF MEDIAEVAL MOORISH PAPERMAKING, WAS CONQUERED EARLY IN THE 1200's BY THE KINGDOM OF ARAGON. TO ENCOURAGE THE PAPERMAKERS OF THE CONQUERED COUNTRY TO PLY THEIR TRADE, JAIME I, KING OF ARAGON, LEVIED A TAX OF 3 DENIERS (SMALL SPANISH COIN).

The SITE OF THE FIRST WOOD PULP MILL IN THE U.S., ESTABLISHED AT CURTISVILLE (NOW INTERLAKEN), MASSACHUSETTS, BY ALBRECHT PAGENSTECHER IN 1866, WAS DEEDED BY PAGENSTECHER'S SON TO THE LAUREL HILL ASSOCIATION OF STOCKBRIDGE, MASSACHUSETTS.

THE AVERAGE, EVERY TON OF PAPER MADE IN THE UNITED STATES REPRESENTS THREE DAYS' WORK PER EMPLOYEE. IN WRITING PAPER MILLS, HOWEVER, ONE TON OF PAPER REPRESENTS A FULL WEEK OF WORK FOR A WORKMAN.

MEDIAEVAL ARABIAN PAPERMAKERS USED WHITE HEMP CORD OF HIGH QUALITY AND OF SYRIAN MANUFACTURE AS A PAPERMAKING MATERIAL.

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ALLIED

LAWSON CO.'S NEW PAPER CUTTER GIVEN PREVIEW AT SCHULKIND LUNCHEON

The E. P. Lawson Company, New York City, is at present engaged in the production of a new Lawson paper cutter which will make its appearance on the market in the near future.

Reports on the various models that will be manufactured under the Lawson trademark were made by the company's engineering staff at a luncheon given recently at Hotel Pennsylvania. The luncheon was in honor of the Lawson company's president, David W. Schulkind, who is celebrating his 35 years in the paper cutting machinery and bindery equipment business. Mr. Schulkind has had a long and colorful career which began in 1910 when he became associated with the New York Branch of the Samuel C. Tatum Company. In 1917, when the E. P. Lawson Company took over the sale of Tatum machinery, Mr. Schulkind was made manager of the Tatum division. In 1922, he became sales manager of the Lawson Company; the following year he became vice president. In 1941, he joined with three of his associates, William J. Hourigan, Lawson Williams, and Herman Sinnegen in purchasing the E. P. Lawson Company, and he was then elected president.

The design of the new Lawson paper cutter is under the direction of Lawson's chief engineer, Fred W. Seybold, who was formerly chief engineer of the Seybold Machine Company and who served in the same capacity with American Type Founders, Inc. until August 1, of this year.

◆

HERCULES COLOR-SOUND FILM TO BE SHOWN IN LATIN AMERICAN COUNTRIES

The Hercules Powder Company's industrial film, "Careers for Cellulose," which traces the manufacture of cellulose plastics from the cotton field to the finished plastic article, will be shown in 20 Latin American countries by the Office of Co-ordinator of Inter-American Affairs.

The all-color, all-sound film is now being translated into Spanish and Portuguese for the Latin American showings.

This behind-the-scenes story of one of America's newest and most colorful industries has already been seen by thousands of American plastics industry employees and the general public.

Starting out with the cotton fields, film then shows the cotton being transformed into cellulose and other bases for plastics, lacquers, film, rayon, and other articles, at Hercules chemical plants in Parlin, New Jersey, and Hopewell, Virginia.

From these chemical plants, the film follows the cellulose materials to Hercules testing laboratories where the cellulose materials are given numerous tests by unusual machines.

The remainder of the film shows the actual manufacture of plastics and demonstrates the wide possibilities of cellulose materials in a variety of industries as well as its many applications in newer plastic developments.

Prints of the film are available without cost for exhibition in the country from Hercules' Cellulose Products Department, Wilmington, Delaware.

◆

HEPPENSTALL COMPANY PLANS NEW RESEARCH LABORATORY

A new research laboratory to cost approximately $170,000 is announced by the Heppenstall Company.

The new laboratory will be housed in a two-story brick building located on the corner of Hatfield and 46th Streets, Pittsburgh, directly opposite the company's plant and less than a block from its general offices. The laboratory will be devoted exclusively to the development of new products and the improvement of items currently being marketed.

James C. Hartley, director of research, will be in charge of the new laboratory.

◆

STANDARD OIL CO. (IND.) BUILDING NEW LABORATORIES

Construction of large, new research laboratories for Standard Oil Company (Indiana) has been started . . . it was announced today by Robert E. Wilson, chairman of the board, and A. W. Peake, president.

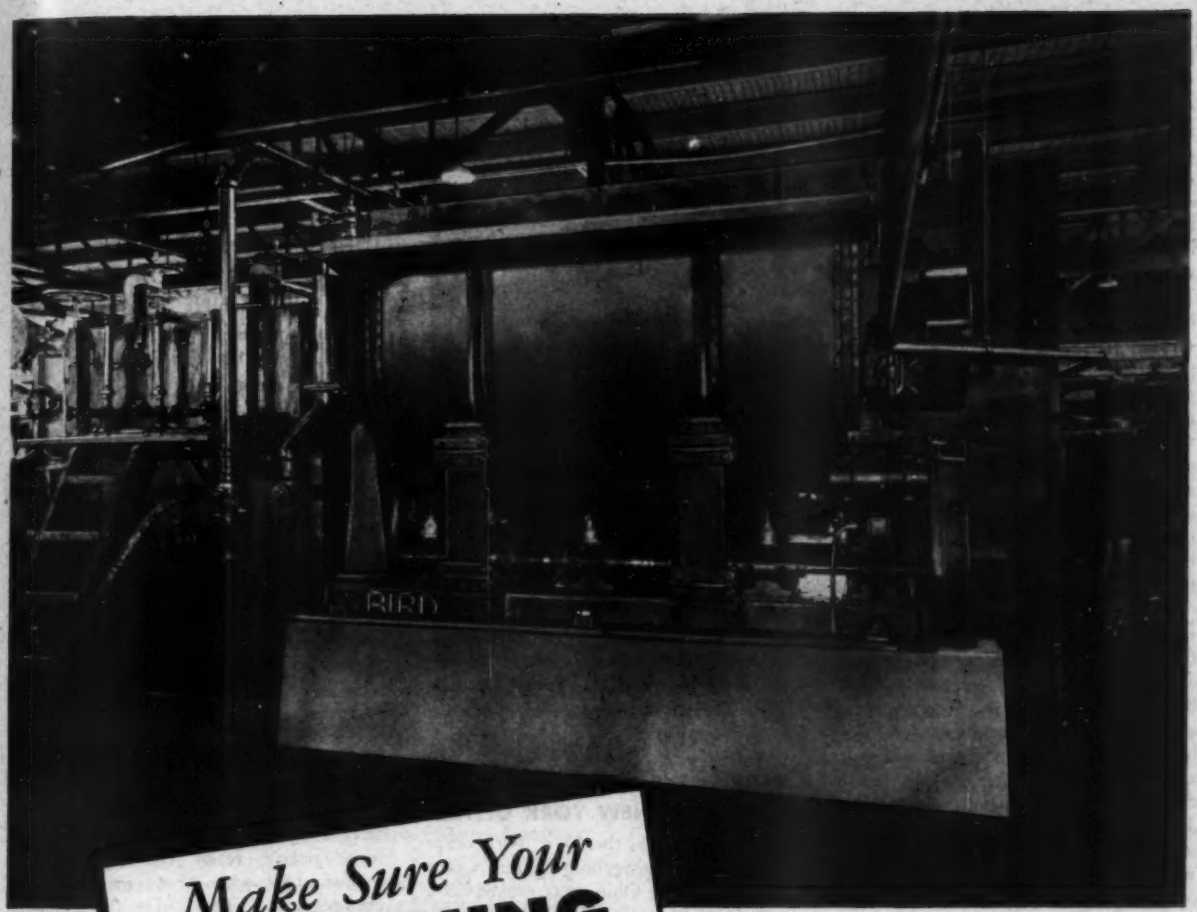
The new research plant will occupy property recently purchased by the company in Hammond, Indiana, near the Whiting refinery, with which it will be connected by pipe lines.

Without waiting for settled peace conditions, Standard will proceed at once with erection of the main administration building, general laboratories, and three pilot-plant buildings. A cafeteria will be included. An engine laboratory, a greenhouse for insecticide work, additional pilot-plant buildings, and other research facilities are scheduled for subsequent construction.

The principal buildings in the group will be of light-gray brick, in the modern type of architecture. They will be air conditioned throughout and lighted in accordance with the best modern practice.

Architects of the project are Holabird & Root of Chicago.

Attending luncheon given by E. P. Lawson Company in honor of its president, David W. Schulkind, were: Front Row (L. to R.)—Wm. J. Hourigan, treasurer; David W. Schulkind, president; Herman Sinnigen, vice president. Back Row (L. to R.)—Lawson Williams, vice president; Charles M. Andrews, Fred W. Seybold, Walter J. Schmidt, Frank Cade and Frank K. Kilwall.



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Screens do more than just take out the dirt. They individualize the fibres for good formation continuously at maximum machine speed.

Make sure your Screens are one hundred per cent right for the job ahead. If there's any question about it, get in touch with *Bird Machine Company, South Walpole, Mass.*, headquarters for the Screen that's standard of the World, the

BIRD SCREEN

Two hundred of the company's technologists and 260 other research workers are at present housed in old and somewhat cramped quarters scattered through the Whiting plant. The new facilities will not only provide room for these workers to expand their activities and operate more efficiently, but also make possible a considerable increase in the company's total research activities.

One of the results will be availability of space for returning veterans without displacement of any of the present research staff. The company plans to take back 179 laboratory employees still with the armed forces without dismissing any of their temporary replacements. Not all the research workers will be accommodated in the new plant, however, as the technical service group will continue in the refinery, close to the operations they serve.

Construction work on the extensive new plant is expected to be a factor in providing at least temporary employment for men released by cutbacks in war industries. It is expected also that the new products developed by research will help create new jobs and will therefore increase permanent employment. In addition to the work on improved fuels and lubricants, part of the research in the new laboratories will be in connection with Standard of Indiana's recently established chemical products department.

"The postwar world is certain to see greatly increased research activity," declared Dr. Wilson in connection with announcement of the plans. "Jet planes and gas turbines will call for entirely new types of fuel. These will include chemicals and plastics as well as new fuels and lubricants. The company or nation that fails to expand its research is likely to watch the procession of competitors pass it by. To meet the vigorous postwar competition, the only answer is more and increasingly efficient research."

◆

CLEVELAND CRANE & ENGIN. ANNOUNCES NEW SALES DIV.

A new sales division to be known as the Heavy Machine Division has been announced by The Cleveland Crane & Engineering Company, Wickliffe, Ohio. The new division will be located in Wickliffe.

The sales of heavy Cleveland overhead traveling cranes and Steelweld bending presses, bulldozers, and special machinery will be handled by this division. Until recently, the Steelweld line of machines was distributed through a general sales agent.

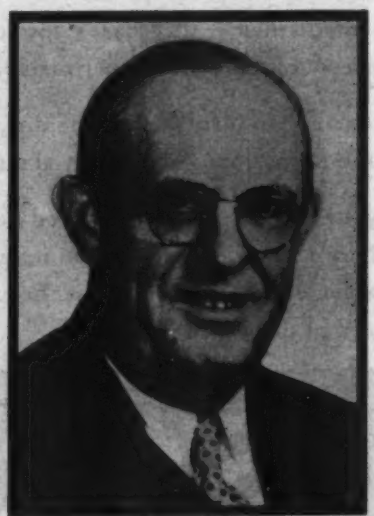
Charles H. Saiter

Charles H. Saiter has been appointed sales manager in charge of the Heavy Machine Division. He was sales manager in charge of the former Heavy Crane Department, and he has been with the company for 23 years in various engineering and sales capacities.

◆

HARRIS-SEYBOLD-POTTER MOVES NEW YORK OFFICES

On August 1, the New York office of the Harris-Seybold-Potter Company, Dayton, Ohio, was moved to a new location at 75 Varick Street. Also effective on that date, sales and service on the products of the Seybold Division of the Company will be handled direct to the trade. All contracts with customers will be through representatives of the Harris-Seybold-Potter Company. The larger quarters now occupied by the company will provide ample facilities to handle the combined activities of the Harris and Seybold Divisions.



J. W. Valiant

J. W. Valiant, for many years vice president in charge of sales in the Eastern District for Harris, is in charge of the combined Seybold and Harris operations at New York.

◆

JOHNS-MANVILLE WILL START POSTWAR EXPANSION WITH FINE LABORATORY

Plans for one of the largest research laboratories of its kind were announced by Johns-Manville on September 6. This will be the first step in a 40 million-dollar expansion program which, it is expected, will provide 25 per cent more jobs than in the company's most successful prewar year.

Dr. C. F. Rassweiler, vice president and director of research, states that the first laboratory unit, in addition to research facilities, also will provide ten experimental factories under one roof. Thus, products initiated in the laboratory may be developed and carried through production stages without leaving the building.

It is expected this will speed up the development of new and improved materials for building and for industrial uses, since new products will be more nearly ready for commercial manufacture when they emerge from the research center. Dr. Rassweiler feels the public is wary of using new building materials until they have been thoroughly tested.

◆

REICHHOLD CHEMICALS, INC., TO BUILD THREE NEW PLANTS FOR CHEM. COLOR PIGMENTS

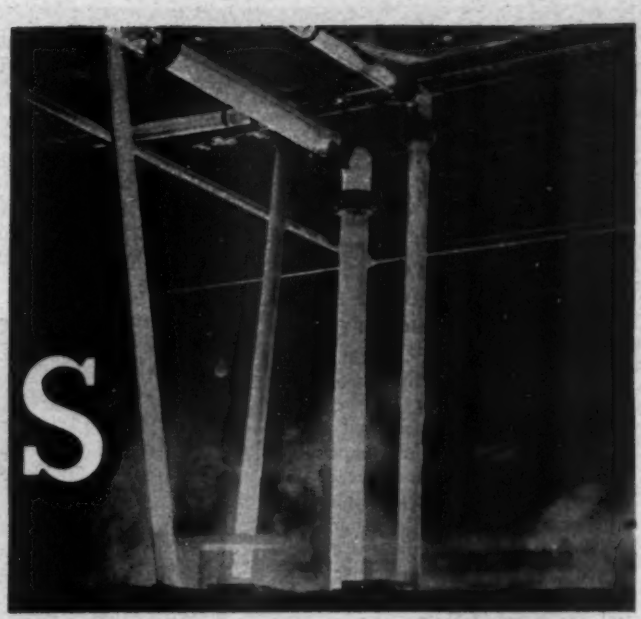
At its first postwar meeting, the board of directors of Reichhold Chemicals, Inc., Detroit, Michigan, completed plans and appropriated the necessary funds to build three new manufacturing plants for the production of chemical color pigments.

The present plant and offices of the chemical color division of the company are located in Brooklyn, which will continue to be headquarters for that division. Sites selected for the three new plants are at Detroit, San Francisco, and Tuscaloosa (Ala.).

The company has announced three objectives in setting forth this, its first major postwar expansion:

1) Additional facilities to meet the greatly increased demand for bright and cheerful colors, which will come from a nation that is eager to throw off the somber colors of war.

2) The production of chemical color pigments in each of the four major sections of the country—north,



GLASS PIPE THAT CAN TAKE SUDDEN TEMPERATURE CHANGES OF 150° F

A SURVEY among plants using PYREX brand Glass Pipe revealed that operating temperatures as high as 250°F. are not unusual, and temperatures as high as 400°F. are possible, under some conditions. But that is not all. Because this pipe can stand sudden temperature changes of 150°F., it can be flushed with hot water or steam. That resistance to thermal shock, combined with the following features, are the reasons why PYREX Pipe has been found so valuable and thoroughly practical for so many different industrial applications.

HEAT RESISTANCE PLUS—

PRODUCT PURITY—With PYREX Pipe heavy metal pick-up is eliminated—an important factor in maintaining product purity.

VISIBILITY—Many users consider the transparency of PYREX Pipe an invaluable operating asset. Every foot of PYREX Pipe is open to your inspection at any time.

CORROSION RESISTANCE—Because PYREX Pipe resists all acids (except HF) and moderate alkalis, it gives years of trouble-free service and reduces replacements due to corrosion to a minimum.

EASE OF INSTALLATION—PYREX Pipe, fittings and hardware are delivered to you ready for assembly. No cutting or threading is necessary. No special tools or training are required. Your own men can do the complete installation job.

LOW COST—From the standpoint of initial outlay and over-all maintenance, PYREX Pipe is your most economical buy. The initial cost is about the same or less than that of full-weight copper or brass in comparable sizes, and less than that of most other corrosion-resistant alloys. But its long life and trouble-free service place it in an economy class all by itself.

SIZES AND FITTINGS—PYREX Pipe is now available in 1″, 1½″, 2″, 3″ and 4″ i.d. Adaptor connections are avaiable for all sizes of standard fittings of other types.

Only PYREX Glass Pipe can give you all of these advantages combined. It may be well worth your while to ask Corning engineers to help you adapt it to the solution of your particular pipe line problem. Write to Industrial Sales Dept. PI9

CORNING GLASS WORKS
CORNING, N. Y.

south, east, and west, in order to provide the best possible service in each district.

3) The increasing of production facilities to implement the nation's full employment program and thereby contribute to said program in each of the four major industrial areas.

◆

B. F. STURTEVANT CO. HAS BEEN ACQUIRED BY WESTINGHOUSE CORP.

The B. F. Sturtevant Company, Boston, Massachusetts, has become a wholly-owned subsidiary of the Westinghouse Electric Corporation. Acquisition of the Sturtevant company by Westinghouse was announced last month; management was assumed on September 1.

The Sturtevant company is a leader in the design and manufacture of air handling and processing equipment, and the merging of its interests with Westinghouse has resulted in one of the most complete organizations in the air conditioning and air handling industry.

Headquarters of the expanded Westinghouse air conditioning activities will be located at Boston. However, heavy-duty and industrial refrigeration manufacture will continue at Jersey City, New Jersey, along with production of the Precipitron, the Westinghouse-developed electronic air cleaner.

In addition to its main plant at Boston, the Sturtevant company has other factories at Camden, New Jersey, LaSalle, Illinois, Berkley, California, and Galt, Ontario, Canada. The business was founded by Benjamin Franklin Sturtevant in 1860.

◆

H. F. RODERICK TO CONDUCT SPECIAL SALES WORK FOR WYANDOTTE

In connection with the expanding production of the various grades of Wyandotte Calcium Carbonate, Howard F. Roderick, former director of research of Wyandotte Chemicals Corporation, Wyandotte, Michigan, is now assigned to special sales work.

Mr. Roderick did the pioneering chemical and development work which resulted in the manufacture of special calcium carbonates by the former Michigan Alkali Company, which he joined in 1931. He is well informed of the needs of the paper, industry for special carbonates—both from a chemical and production standpoint. His transfer to the sales department coincides with the breaking of ground for a new carbonate plant by the Wyandotte Chemicals Corporation which will increase its production 50 per cent. It is expected the new plant will be completed early in the spring of 1946.

Under Mr. Roderick's direction, the Wyandotte Research Laboratories have expanded to the present total of 15 sections—among which are organic, inorganic, paper and pulp, rubber and pigment sections, as well as a rapidly expanding pilot plant.

Howard F. Roderick

Dr. Thomas H. Vaughn, assistant director of research for the past six years, will replace Mr. Roderick. Dr. Vaughn formerly headed the Organic Division of Union Carbon and Carbide Research Laboratories. In his new position, Mr. Roderick will act under the direction of Bert Cremers, vice president in charge of sales, Michigan Alkali Division of Wyandotte Chemicals Corporation.

◆

DU PONT SEEKING SITE IN THE PACIFIC NW

Through Pacific Northwest pulp and paper sources, it has been learned that E. I. du Pont de Nemours & Company (Wilmington, Delaware) has had engineers surveying sites in the Willamette Valley of Oregon for a site for a major rayon manufacturing plant. It is understood that the du Pont company is searching for a site where wood wastes or pulp will be available for the manufacture of rayon cord.

Sites on the McKenzie River near Eugene, Oregon, and on the Santiam River at Albany (Ore.) have been mentioned as possibilities. Either would afford a required 500 acre building site close to a cold water supply as well as to power from Bonneville Power Administration lines.

NEW MILLION-DOLLAR PLANT STARTED BY PHILCO CORPORATION

Presided over by John Ballantyne, president, special ceremonies attended the beginning of work on an ultra-modern plant to be built by Philco Corporation, Philadelphia.

The new plant will feature the longest continuous radio production lines in the world and will cover one block. The plant will contain 300,000 sq. ft. of floor space and will cost upwards of a million dollars. It will provide eight parallel conveyor lines for high-speed manufacture of console radios and radio-phonographs. A novel U-shaped pattern for the flow of production through the top two floors of the new plant will make possible continuous movement of materials through the various assembly operations.

◆

A. C. HORN CO. NOW A DIVISION OF GENERAL PRINTING INK CORP.

The consolidation of the A. C. Horn Company, Long Island City, New York, with the General Printing Ink Corporation, was announced August 22. The Horn company hereafter will be known as a division of the General Printing Ink Corporation. It is contemplated that the consolidation will change its name to the Sun Chemical Corporation in the very near future.

The consolidation is planning for joint research into many fields including paints, industrial finishes, adhesives, plastics, resins, new methods of pigment dispersion, and general chemical research. It is contemplated that A. C. Horn will become a member of the board of directors of the General Printing Ink Corporation, and that A. E. Horn will succeed him as president of the A. C. Horn Company Division. The stock of the A. C. Horn Company will be exchanged for General Printing Ink Corporation stock.

◆

GOODRICH PLACES CONTRACT FOR PLANT AT AVON LAKE

Contract has been placed for the new semi-works plant of The B. F. Goodrich Chemical Company at Avon Lake, 15 miles west of Cleveland. The cost is to be around $600,000.

Early this year announcement was made that the company had secured an option on the site and that work would be started as soon as government approval was obtained (Cf. P.I. & P. W., March, 1945, p. 1630).

Designed as a versatile small-scale chemical plant which can be converted easily to a variety of processes, the plant will be used to develop manu-

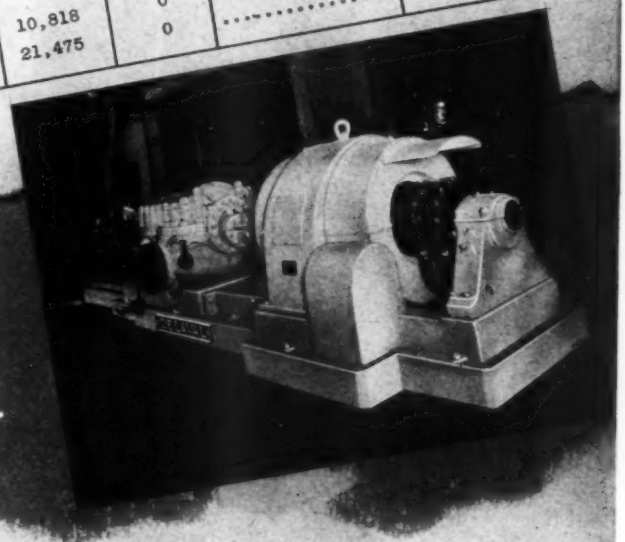
Look at the Record!

SERVICE RECORD—As of September 1, 1944

DE LAVAL PUMPS at _____

No.	Discharge Pressure psig	Suction Temp. °F.	Placed in Service	Total Service Hours	Outages Due to Pump	Cause of Outages	Approx. % Increase in Pump Power
14	1186	260°	12- 2-38	40,383	2	Replace ball locating bearing and shaft sleeves	Negligible
					1	Replace shaft sleeves	Negligible
15	1186	260°	10-11-40	28,839	0	.....	Negligible
21	1186	350°	8- 4-39	10,818	0	.....	5%
16	1186	260°	1- 2-42	21,475			

Capacity (all units).....1455 g.p.m.



of DE LAVAL HIGH-PRESSURE BOILER-FEED PUMP PERFORMANCE

Not one major trouble after as much as 40,000 hours of service!

The first of these units was installed in February, 1938; the most recent in February, 1942. All have demonstrated the satisfactory performance of De Laval boiler-feed pumps for high-pressure central station service.

Other important installations, operating at pressures up to 1600 psi and handling high temperature feed water, are operating with equal freedom from trouble, due in no small measure to the excellent performance of the De Laval automatic balancing device, the De Laval large clearance labyrinth wearing rings, and the sturdiness of De Laval solid end head construction.

3629

TURBINES • HELICAL GEARS • WORM GEAR SPEED REDUCERS CENTRIFUGAL PUMPS • CENTRIFUGAL BLOWERS and COMPRESSORS • IMO OIL PUMPS

DE LAVAL

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facturing routines for new synthetic resins and chemicals. New adaptations of the company's line of Geon polyvinyl chloride resins will be processed here, as the intermediate operation between the pilot plant of the laboratory and commercial production.

◆

RFC APPROVES HERCULES' PURCHASE OF PARLIN, N. J., NITROCELLULOSE PLANT

Hercules Powder Company, Wilmington, Delaware, on September 5 announced that the Reconstruction Finance Corporation has approved its purchase of the B line nitrocellulose plant, adjacent to Hercules' Parlin (N. J.) plant.

The facilities of this newly acquired plant will be utilized primarily to increase the production of cellulose acetate. Other cellulose derivatives which along with cellulose acetate are manufactured at the Parlin plant, also may be manufactured.

New equipment must necessarily be installed, but because of the uncertainty connected with construction work, no date for the beginning of operations can be approximated.

Construction of the nitrocellulose facilities was started in September, 1940. The plant was operated for two years and nine months, and produced approximately 120,000,000 pounds of nitrocellulose and 143,000,000 pounds of nitric acid.

◆

MONSANTO ACQUIRES SITE NEAR SEATTLE FOR NEW PLYWOOD ADHESIVE PLANT

Expansion of chemical manufacturing facilities on the West coast is indicated by the announcement that Monsanto Chemical Company, St. Louis, Missouri, will build a modern plywood adhesive plant just outside the city limits of Seattle (Wash.) A site of about 29 acres has been purchased through the company's Seattle subsidiary, I. F. Laucks, Inc. The new facility will combine Laucks operations now carried on in two present Seattle plants. At the present, the site of the new plant is also the site of a prisoner-of-war camp.

Produced at the new location will be synthetic resins for adhesives, and coatings and wood preservatives now made in the two Laucks plants. It is indicated that offices and research laboratories of the subsidiary which Monsanto acquired last year, eventually will be moved to the new location.

◆

STANDARD OIL CO. (IND.) ANNOUNCES NEW CHEMICAL PRODUCTS DEPARTMENT

A new department, to be known as the chemical products department, has been announced by the Standard Oil Company (Indiana).

The immediate duties of this department will be to explore the market for petroleum chemicals, work with research and manufacturing departments in developing and producing marketable derivatives, and manage sales and distribution. Manager of the new department is William B. Plummer, formerly manager of the company's development and patent department, and during the war, until recently, a lieutenant colonel in the Air Technical Service Command, A.A.F. Howard R. Peterson, an experienced member of Standard's sales technical service, will be in charge of sales development.

The use of new synthetic and catalytic processes for manufacturing petroleum products has reached a degree of importance overshadowing that of older methods of refining. Mr. Plummer has pointed out that these processes are making new chemical by-products available and paving the way for still further developments in the petroleum chemical field.

POST-WAR GUIDE FOR PIPE USERS

On what applications can light-weight pipe do a better job for you? Why does Naylor Pipe provide advantages found in no other light-weight pipe? What new Naylor development has revolutionized pipe coupling? The answers to these and many other questions of importance to you are presented in the new Naylor Catalog just off the press. Here is a practical guide that provides a working tool for everyone planning post-war piping.

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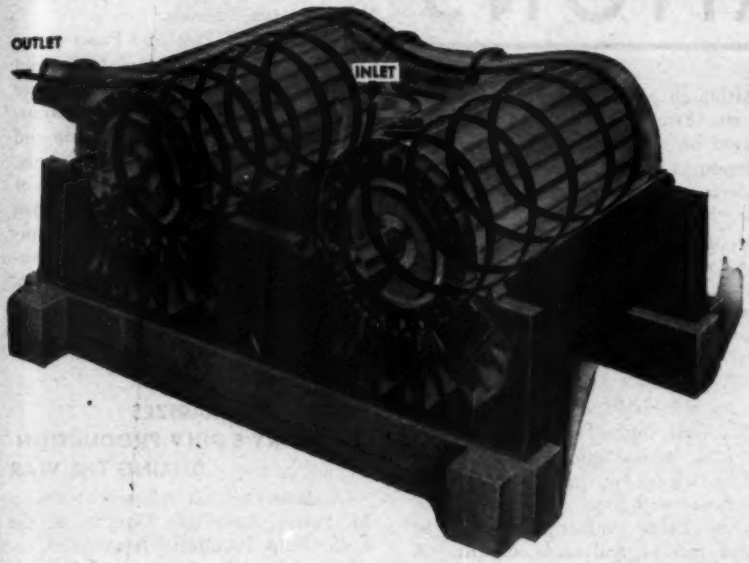

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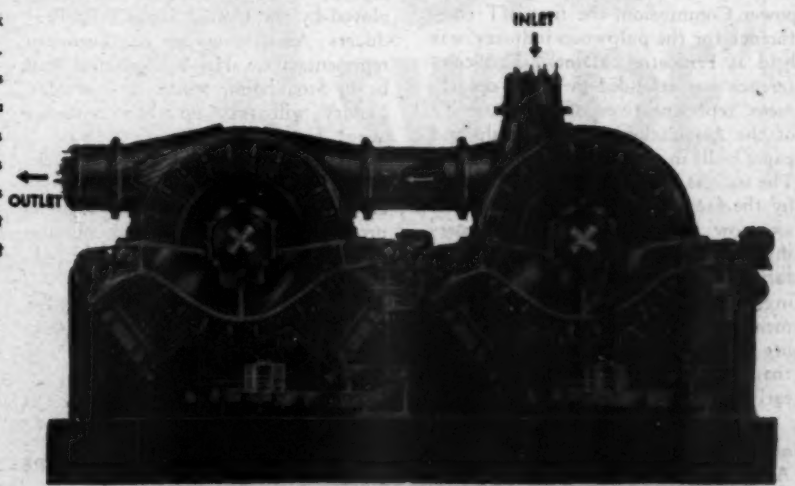
for continuous or batch beating

Units furnished for either continuous or batch beating . . . Rapid circulation with highly efficient treatment . . . Flexible to meet the needs of a wide scope of conditions . . . Designed so that all stock is treated uniformly . . . Desired roll setting, once determined, can be repeated at any time . . . Permits control and variation of hydrating effect . . . Provides high tear value of any given Mullen . . . Eliminates unnecessary circulation therefore uses low h.p. per ton . . . Handles large capacities efficiently up to 6% density . . . Saves considerable floor space . . . Minimum contact and friction of beater parts . . . Operates for considerable periods of time without attention . . . Continuous Beater supplied in two or more units (rolls) in series . . . Each roll can be controlled independently.

Smith-Egan continuous two-unit beater. The stock is carried from the inlet directly to the bedplates. The pressure of the stock (head and back) tends to drive the stock under and across the roll in a spiral fashion, with the result that the stock passes between bedplates and roll a number of times before reaching the outlet of the chamber. This same action is repeated in each subsequent chamber until the stock reaches the final outlet and flows to the chest.



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ASSOCIATIONS

PULPWOOD LABOR TRAINING CONFERENCES ORGANIZED BY AMER. PULPWOOD ASS'N

The Mechanization Program of the American Pulpwood Association, which for the past year has been actively engaged in developing and spreading the use of mechanized equipment in pulpwood logging, has accentuated the need for men trained in logging technique. In addition, faced with the upward trend of labor costs, and the downward trend of labor efficiency, some remedy to overcome these handicaps must be employed.

With these factors in mind, the Board of Directors authorized the entrance of the Association into a program which had as its aim the training of men in various phases of pulpwood production—conditioning of hand tools, work planning, accident prevention, crew organization, and the care, maintenance, and repair of power saws and equipment.

This program commonly known as Job Instructor Training (JIT) was first introduced by the U. S. Forest Service and the War Manpower Commission. The American Pulpwood Association actively entered this field last September when, in co-operation with the American Paper and Pulp Association, the Timber Production War Project, and the Training Within Industry Branch of the War Manpower Commission, the first JIT conference for the pulpwood industry was held at Princeton, Maine. This conference was attended by wood department representatives of the majority of the Association's member pulp and paper mills in the New England States. The success of the conference is shown by the fact that these same companies are now requesting follow-up meetings—one to include these representatives who attended last year's meeting, and another for a new group of men. Plans for this follow-up meeting are being considered, and it is hoped that a meeting can be held some time early this Fall.

The second of these JIT conferences organized by the American Pulpwood Association was held in February of this year at Warrensburg, New York, in co-operation with the Pack Demonstration Forest at Syracuse University, and the U. S. Forest Service. This conference included representatives of the wood department of pulp and paper companies in the New York-Pennsylvania area.

Although personnel to head up JIT for the Association has not yet been secured on a full-time basis, the Association is prepared to hold training conferences and up to the present time, has secured the services, part time, of a well qualified man to instruct in JIT. At this writing, conferences are planned for the Lake States region and the northwestern region some time this fall.

It is very necessary that our Industry consider, study, and develop training methods for woods labor. Our professional, high-class woods labor of the past, which gained its efficiency and knowledge by the slow process of experience and time, is being fast depleted. Labor replacements must be found, trained, and made efficient. A comprehensive program in Job Instructor Training will accomplish this purpose, and it is to this end that the American Pulpwood Association stands ready to assist any group in organizing training conferences for pulpwood production labor.

◆

PULP PRODUCERS ASS'N SENDS PIERRE LANDRY AS REPRESENTATIVE TO EUROPE

Pierre J. Landry, of Kelso (Wash.), former owner of the Kelso Veneer Company and more recently an editorial writer for the Longview, Washington, *Daily News*, has been employed by the United States Pulp Producers Association as its European representative. His headquarters will be in Stockholm, where he and Mrs. Landry will take up their residence about January 1, 1946.

Mr. Landry will spend several weeks in the New York office of the Association to familiarize himself with its program and activities and he also plans to visit member mills in all portions of the country.

Mr. Landry was born in Algiers. He was educated in Europe and speaks several languages.

◆

CANADIAN PULP AND PAPER ASSOCIATION SENDS TWO REPRESENTATIVES TO EUROPE

In line with its vigorous program of assistance to Canadian industry toward reconversion to successful peacetime activity, the Department of Reconstruction at Ottawa is sponsoring the sending of industrial scouts to Europe. The basic plan is to investigate developments in enemy countries during recent years that might be applied in some way to Canadian manufacturers and business.

The Canadian Pulp and Paper Association was asked to nominate two representatives who could participate in this plan. Dr. Wm. Boyd Campbell, assistant director of the Pulp and Paper Research Institute of Canada, and Dr. Allan C. Hill, chairman of the Technical Section of the Canadian Pulp and Paper Association and member of the Joint Administrative committee of the Institute, were chosen. They left Canada towards the end of July and will probably be abroad for several weeks.

◆

PORTER SUMMARIZES INDUSTRY'S PULP PRODUCTION DURING THE WAR

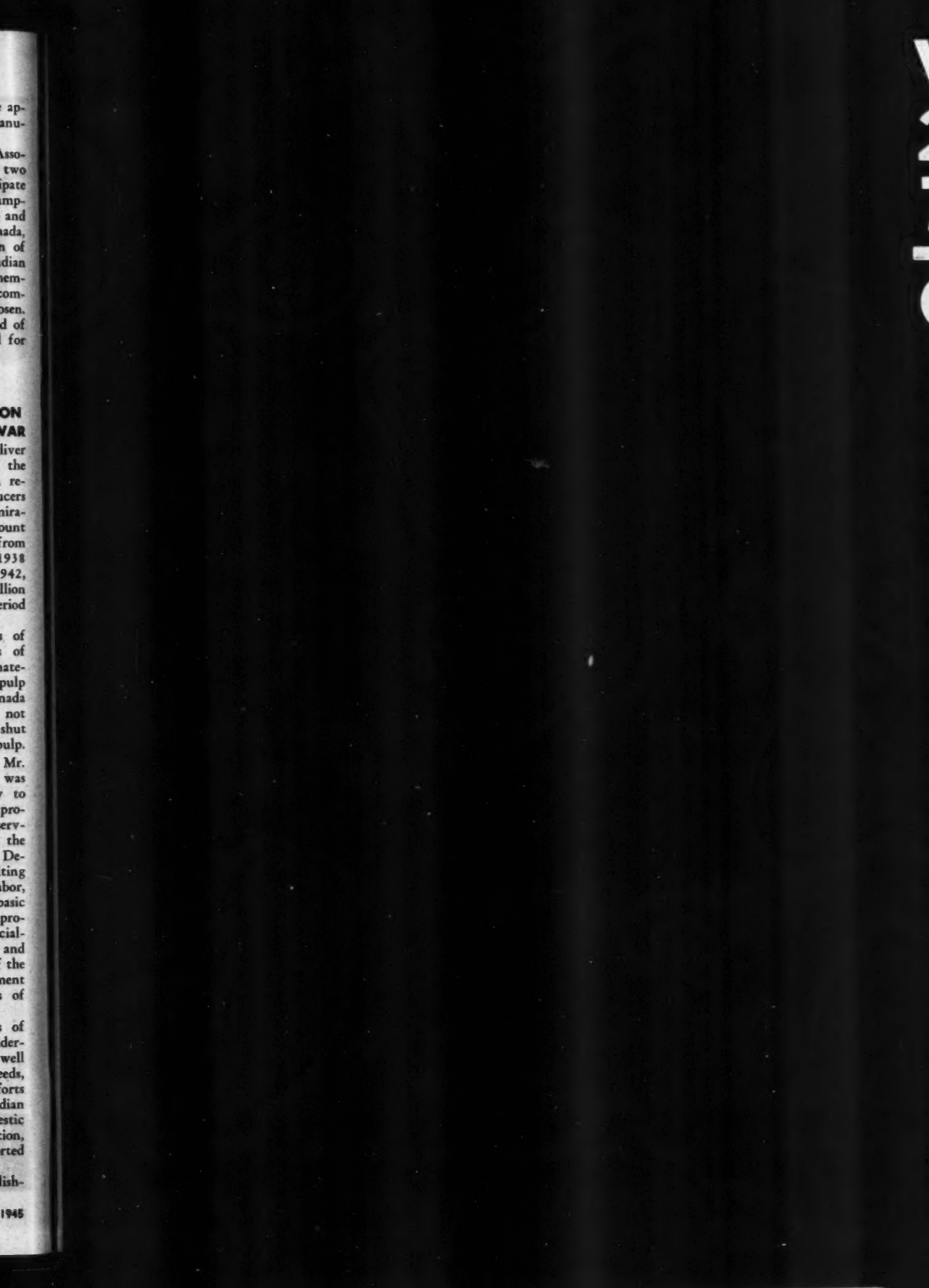
A statement just released by Oliver M. Porter, Executive Director of the U S. Pulp Producers Association reveals that Amerlean pulp producers performed one of the industrial miracles of the war by jumping the amount of pulp produced in this country from approximately 6 million tons in 1938 to almost 11 million tons in 1942, with an average of nearly 10 million tons a year during this entire period of the war.

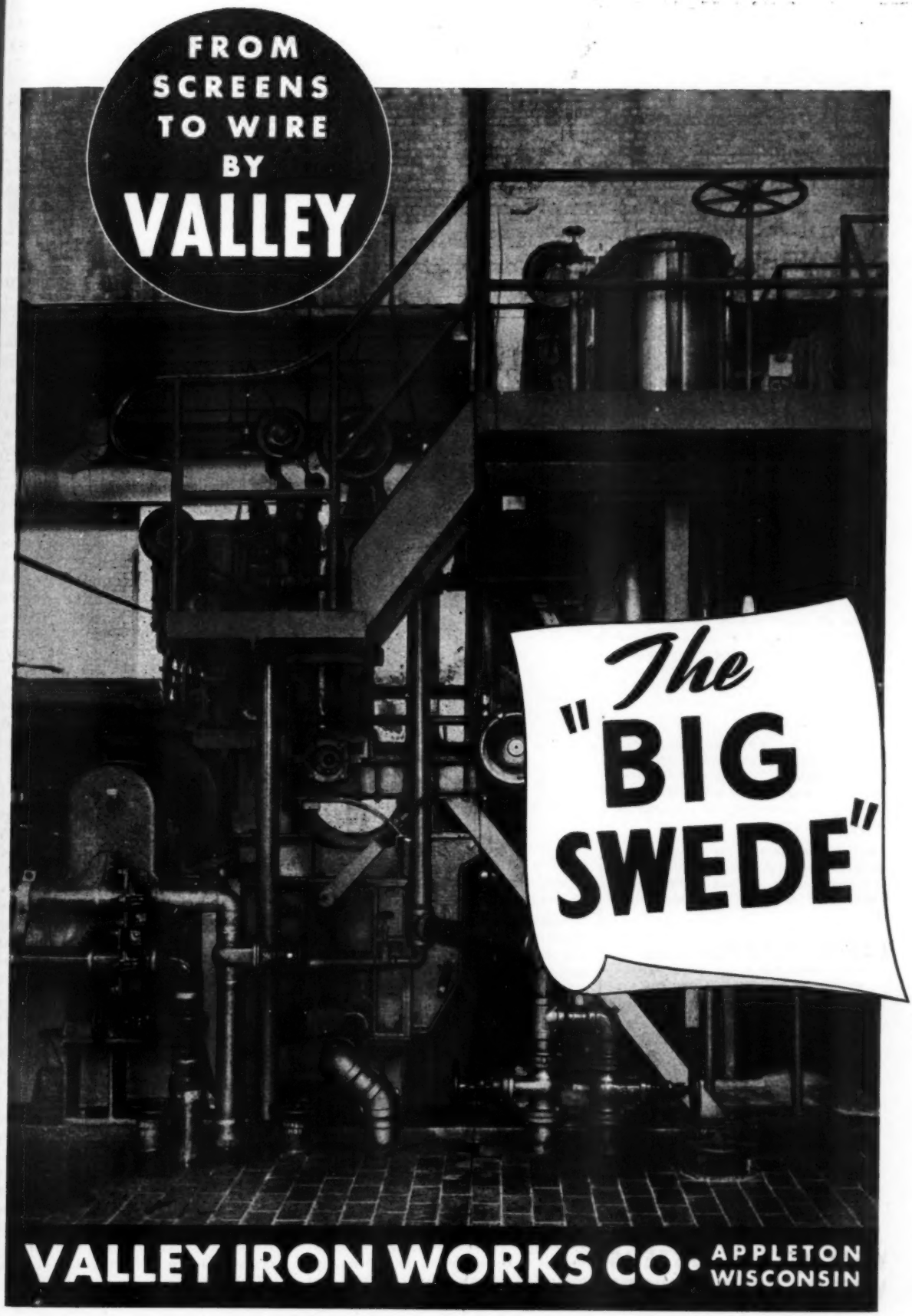
Despite the terrific difficulties of obtaining the necessary supplies of pulpwood and other essential materials, Mr. Porter said that the pulp mills of the United States and Canada so increased their production that not a single paper or board mill was shut down during the war for lack of pulp.

In continuing his statement, Mr. Porter said: "When war came, it was necessary for American industry to concentrate immediately on the production of essential goods and services. The wood pulp industry of the United States met that challenge. Despite increasing difficulties resulting from inadequate supplies of labor, wood and transportation, this basic American industry increased its production of nitrating and other specialized pulps needed in the war effort and supplied an ever increasing share of the pulps required by the government agencies and civilian populations of all the Allied Nations.

"The tremendous requirements of our armed forces and, to a considerable extent, those of our allies, as well as our own essential civilian needs, were met by the extraordinary efforts of the United States and Canadian pulp mills to keep all of our domestic paper and board mills in operation, since no European pulp was imported after 1940.

"This extraordinary accomplish-

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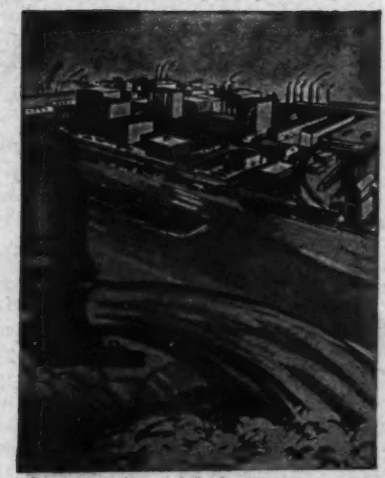

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LAYNE

WELL WATER SYSTEMS
VERTICAL TURBINE PUMPS

ment was made possible by the system of Pulp Allocation and its collateral controls devised by David Graham and later carried on by Robert Evans. Full credit for its effectiveness is also due to the staff of the WPB's Pulp Allocation Unit, its Industry Advisors and the Pulp Allocation Committee, whose membership represented market pulp producers and both converting and self-contained paper and paperboard manufacturers.

"America is indeed fortunate that when the war came its pulp and paper industry was the most highly developed in the world, and that this industry was ready and able to supply the added paper required for wartime communications, wrappings, containers, sanitary and fiber-base products, maps, books, magazines, newspapers and the myriad of specialized products required by a great nation at war.

"A glance at the record of the pulp industry's performance shows how completely it met our national war requirements and filled the gap created by the cessation of European exports to this country.

	Average Annual Tonnage (In tons of 2,000 pounds)	
	Prewar Years 1935 through 1939	War Years 1940 through 1944
U. S. Pulp Production	6,024,000	9,981,000
U. S. Pulp Imports*	2,068,000	1,199,000
U. S. Pulp Exports	193,000	341,000
Domestic Pulp Sales	658,000	1,521,000
U. S. Pulp Consumption	7,899,000	11,116,000

*From Canada and Newfoundland after 1940.

"During the 10-year period from 1935 to 1944 United States paper and paperboard production increased from 10,500,000 tons to a record of 17,800,000 tons. This increase in production, particularly during the war years, was made possible largely because the domestic pulp industry performed the miracle of production shown by the following figures:

	Total U. S. Pulp Production, All Grades (short tons)
1938	5,933,560
1939	6,993,334
1940	8,959,559
1941	10,375,422
1942	10,783,430
1943	9,680,462
1944	10,108,443
1945 (first 6 mos.)	5,219,000

"The pulp industry of the United States in confident that given equal opportunity with its foreign competitors, it can provide maximum employment for its own labor and capital as well as for that of its dependent industries, and can continue to furnish domestic consumers with a stable supply of satisfactory pulp for all purposes, and at a reasonable price. The pulp industry of the United States fully met its obligations in time of War; it intends to do so in time of Peace, and thereby maintain its essential position in our national economy and contribute its full share to the security, welfare and progress of the United States."

◆

TAPPI FALL MEETNG CANCELED

The fall meeting of the Technical Association of the Pulp and Paper Industry, tentatively scheduled to be held in Buffalo, N. Y., during the week of September 17th was canceled by the unanimous vote of the Association's Executive Committee at its regular quarterly meeting in New York. The continuation of the Office of Defense Transportation ban on national conventions and the more recent restrictions on civilian travel made this step necessary. Local sections are urged by President Edwardes to take advantage of this opportunity to strengthen their organizations and to make an extra effort to conduct programs at their regional meeting that will definitely contribute to the technical advancement of the pulp, paper, paperboard and converting industries. National committees are requested to proceed with plans for the annual meeting to be held at the Commodore Hotel, New York City, during the week of February 24, 1946.

◆

▶▶▶ THE EASTERN DIVISION of the Salesmen's Association of the Paper Industry celebrated the end of the war with Japan with a golf tournment at the Winged Foot Country Club, Mamoroneck, N. Y. some sixty players just sitting down to dinner as the news of Japan's surrender was received. Herb Simmons, of the Fitchburg Paper Company, was the first winner of a new perpetual trophy, named in honor of Lieut. Wally Wilson, U.S.N.R., the only one of the New York salesmen to lose his life in the war.

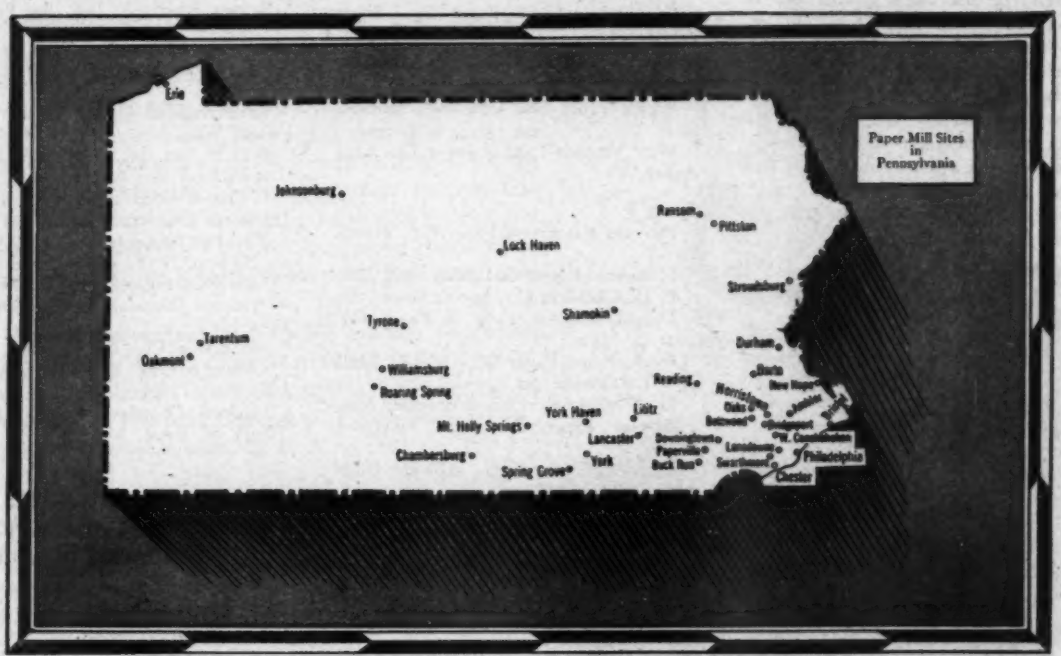
◆

▶▶▶ THE NEW British Paper and Board Industrial Research Association has just appointed Dr Norman R. Hood as its director. Dr. Hood comes from I.C.I., where he has been for many years. Just before the war he visited the United States to study a newly developed coal and mineral separation process. During his visit he traveled extensively throughout the States and Canada.

Draper's

ATLAS OF AMERICAN PAPERMAKING

No. 9 PUBLISHED BY DRAPER BROTHERS COMPANY • CANTON, MASSACHUSETTS



Map copyright by L. D. Post, Inc., New York. American Map Co., N. Y.

HIGH LIGHTS: Pennsylvania, the cradle of American papermaking, is one of the six States in which production of paper nearly reaches, or else surpasses 1,000,000 tons per annum. To have held its important position for more than 300 years, since the establishment of the first American paper mill at Roxborough in 1690, is a fine achievement. The lineal descendant of this pioneer plant now operates as the Dill & Collins Division of the Mead Corporation, in Philadelphia.

Pennsylvania may take pride in three other achievements; the first domestic manufacture of straw paper and soda pulp and the invention of the sulphite process. Colonel William Magaw of Meadville, confided his discovery of straw pulp to G. A. Shryrock, of the Hollywell paper mill near Chambersburg, and production began there in 1829. Hugh Burgess patented his soda pulp process in 1854, and in 1863 began production on a commercial scale with the American Wood Paper Company at Manayunk. Benjamin and Richard Tilghman of Philadelphia invented the sulphite process, and a patent was issued to the former in 1866.

Further evidence of Philadelphia's interest in the paper industry is the existence in the Franklin Museum of a paper exhibit containing a working model of a paper machine. The *Study Course for Paper Salesmen* inaugurated in 1936 by the Paper Trade Association of Philadelphia, in conjunction with members of the Allied Trades and the State College of Pennsylvania, although now in abeyance, is memorable as the only course yet established (except by correspondence) in this important but long neglected field.

Pennsylvania has 57 paper mills and 9 pulp mills; 84 Fourdriniers, 46 cylinder machines, 3 Yankees, 1 wet machine.

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S A F E T Y

THE PAPER INDUSTRY SAFETY CONTEST

The final standings of mills in the 1944-1945 Paper Industry Safety Contest have now been announced. Since the Annual Safety Congress will not be held this fall, the group trophies and certificates will be awarded by the National Safety Council through the use of a system yet to be decided. The mill that will receive the Edward Benton Fritz Memorial Trophy (the major award) will be chosen by the judges and that trophy awarded by the donor, THE PAPER INDUSTRY AND PAPER WORLD.

Following is a list of mills that had perfect scores and those ranking first, second, and third in Groups A, B, C, D, and Remanufacturing:

Group A

1—The Flintkote Co., Pioneer Division, Los Angeles, Calif.
2—Consolidated Paper Corporation, Ltd., Laurentide, (P. Q.) Division.
3—The Champion Paper & Fibre Co., Hamilton (Ohio) Division.

Group B

1—Consolidated Paper Corp., Ltd., Port Alfred, P. Q.
2—Kimberly-Clark Corp., Niagara Mill, Niagara Falls (New York) Division.
3—The Flintkote Co., Meridian, Miss.

Group C

1—Price Brothers & Co., Ltd., Jonquiere mill, Quebec, Can.
2—Container Corp. of America, Carthage, Ind.
3—The Flintkote Co., Little Ferry, N. J.

Group D

1—Marathon Corp., Ashland (Wis.) Division.
1—Strathmore Paper Co., No. 1 mill, Woronoco, Mass.
1—E. I. du Pont de Nemours & Co., Inc., Newhall Plant, Wilmington, Del.

Remanufacturing

1—Bird & Son, Inc., Shreveport (La.) Roofing Plant.
1—Bay West Paper Co., Green Bay, Wis.
3—The Flintkote Co., Chicago Heights, Ill.

Reduction Awards in 1944-1945 Paper Industry Contest

Group A

Rhinelander Paper Co., Rhinelander, Wis.
Anglo-Canadian Pulp & Paper Mills, Ltd., Quebec, Can.
Hollingsworth & Whitney Co., (Algonquin & Taconnet Mills) Winslow, Me.
Champion Paper & Fibre Co., Canton, N. C.
Bird & Son, Inc., East Walpole, Mass.
The Gardner-Richardson Co., Lockland, Ohio.
Consolidated Paper Corp., Ltd., (Belgo Division) Shawinigan Falls, Que.
Price Bros. & Co., Ltd., Kenogami, Que.
The Mead Corp., Chillicothe (Ohio) Division.
Kimberly-Clark Corp., (Lakeview Mill) Neenah, Wis.
Can. International Paper Co., Three Rivers, Que.
The Gardner-Richardson Co., Middletown, Ohio.
Brown Paper Mill Co., Inc., Monroe, La.
West Virginia Pulp & Paper Co., Covington, Va.

Group B

Paterson Parchment Paper Co., Bristol, Pa.
Marinette Paper Co., Marinette, Wis.
P. H. Glatfelter Co., Spring Grove, Pa.
Detroit Sulphite Pulp & Paper Co., Detroit, Mich.
International Paper Co. (No. 55 Mill) No. Tonawanda, N. Y.
U. S. Gypsum Co., Greenville, Miss.
Mersey Paper Co., Ltd., Liverpool, N. S.
Kimberly-Clark Corp., (Badger-Globe Mills) Neenah, Wis.
Cornell Wood Products Co., Cornell, Wis.
The Ontario-Minnesota Pulp & Paper Co., Ltd., Kenora (Ont.) Division.
The Ontario-Minnesota Pulp & Paper Co., Ltd., Fort Frances (Ont.) Division.

Group C

Certain-teed Products Corp., York, Pa.
The Crystal Tissue Co., Middletown, Ohio.
Hoberg Paper Mills, (Fibre Division) Green Bay, Wis.
Certain-teed Products Corp., Niagara Falls, N. Y.
The Wisconsin River Paper & Pulp Co., Stevens Point, Wis.
Rising Paper Co., Housatonic, Mass.
Port Huron Sulphite & Paper Co., Port Huron, Mich.
Certain-teed Products Corp., Marseilles, Ill.
Certain-teed Products Corp., Richmond, Calif.
The Lawrence Paper Co., Lawrence, Kans.
Certain-teed Products Corp., Savannah, Ga.
Finch, Pruyn & Co., Inc., Glens Falls, N. Y.
Ontonagon Fibre Corp., Ontonagon, Mich.
Port Huron Sulphite & Paper Co., Port Huron, Mich.
The Mead Corp., Harriman, Tenn.

Group D

American Writing Paper Corp., (Riverside Division) Holyoke, Mass.
Hollingsworth & Whitney Co., (Abenaquis Mill) Madison, Me.
American Writing Paper Corp., (Parsons Division) Holyoke, Mass.
Alton Box Board Co., Carlyle, Ill.
U. S. Gypsum Co., No. Kansas City, Mo.
Certain-teed Products Corp., Kansas City, Mo.
Crown Zellerbach Corp., (Crown Willamette Paper Co. Division) Camas, Wash.
Certain-teed Products Corp., Buffalo, N. Y.
Central Fibre Products Co., Denver, Colo.
Rogers Fiber Co., Inc., Bar Falls, Me.

Remanufacturing

Container Corp. of America, Cleveland, Ohio.
Kimberly-Clark Corp., (Atlas Mill) Appleton, Wis.
Bird & Son, Inc., Norwood, Mass.
Iowa Fiber Box Co., Keokuk, Iowa.
Container Corp. of America, (35th St. Division) Chicago.
The Fort Orange Paper Co., Castleton on Hudson, N. Y.
Lanzit Corrugated Box Co., Chicago.
National Container Corp., Long Island City, N. Y.
Dixie Cup Co., Easton, Pa.
Container Corp. of America, Anderson, Ind.
Gaylord Container Corp., (11th St. Plant) St. Louis, Mo.

◆

TWO NEW SAFETY CODES ISSUED BY THE AMERICAN STANDARDS ASSOCIATION

The publication of two new safety codes is announced by the American Standards Association.

The new Safety Color Code for Marking Physical Hazards was developed by one of the Association's war committees at the specific request of the War Department, but it also has a wide application in industry. This standard is a codification of certain already recognized concepts regarding use of color for safety purposes (Cf. P.I. and P.W., June, 1945, p. 394).

The purpose of this Color Code is to unify on a national scale the colored markings used to warn employees of certain physical dangers to be avoided, to mark the location of safety equipment, and to identify other protective equipment.

The Association also has just announced a new Safety Code for industrial use of X-rays, which has been prepared by a war committee. This code, drawn up by a committee of the nation's leading experts on Industrial Roentgenology, with George Singer, of the National Bureau of Standards as chairman, is designed to protect workers in the many thousands of plants that are using X-ray.

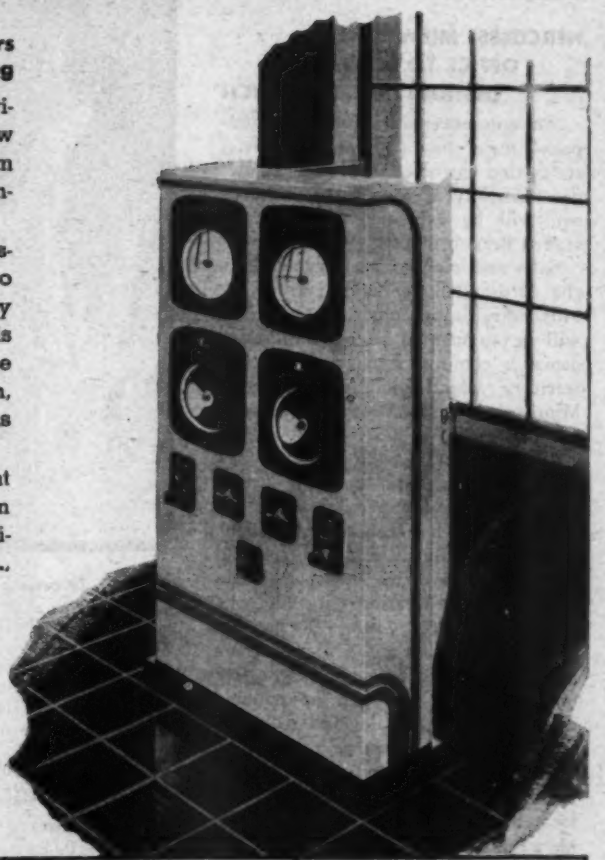
The Last Word, IN AUTOMATIC CONTROL FOR SULPHITE DIGESTERS!

New compact Universal Control System offers new high quality and economy in pulp cooking

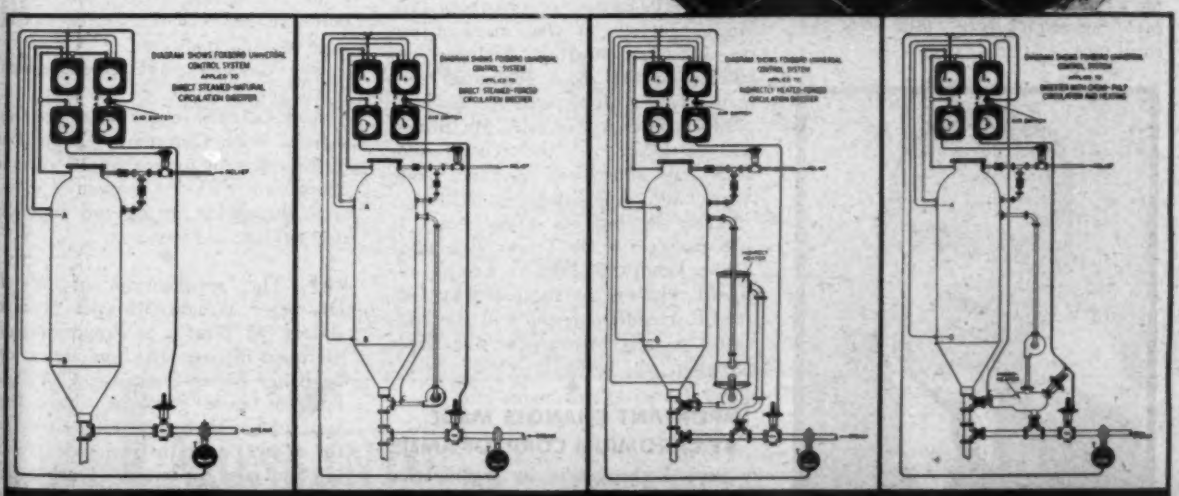
From more than 20 years of down-to-earth experience in pulp-cooking instrumentation, Foxboro now has developed a complete "packaged" control system that sets a new high in combined performance, convenience and versatility.

Unaided, the new Foxboro Universal Control System regulates digester heat input and gas relief so that cooking pressure and temperature follow exactly prescribed schedules from start to finish. Further, this efficient modern unit is equally suitable for any type of sulphite digester – natural or forced circulation, direct-steamed or externally-heated. (See diagrams below.)

Write for detailed information on this important advance in sulphite digester control. Also data on similar "packaged" control systems for alkaline digesters. **The Foxboro Company, 158 Neponset Ave., Foxboro Massachusetts, U. S. A.**



Foxboro Automatic Digester Control Unit. Supplied complete with following instruments ready-mounted in a modern protective steel cabinet: 1. Foxboro Steam Flow and Liquid Level Recorder with Steam Flow Integrator (top left); 2. Foxboro Dynalog (electronic) Three-Point Temperature and Top Pressure Recorder (top right); 3. Foxboro Cam Schedule Pressure Controller (lower left); 4. Foxboro Cam Schedule Steaming Controller (lower right).



FOXBORO
REG. U. S. PAT. OFF.

AUTOMATIC
DIGESTER CONTROL

NAMES *in the* NEWS

Personals

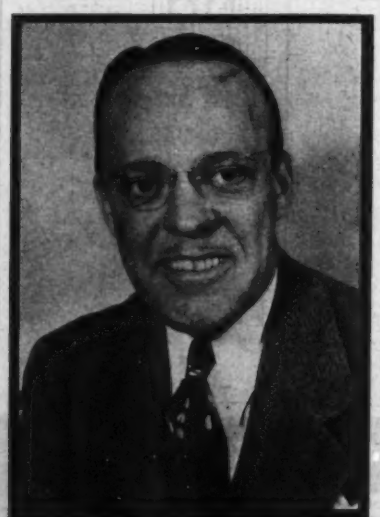
HERCULES' MILWAUKEE OFFICE TO BECOME A DISTRICT SALES BRANCH

An announcement from the company's main office (Wilmington, Del.) states that the office of Hercules Powder Company at Milwaukee, Wisconsin, will be expanded into a fully staffed branch office.

Sales and technical service work in the future will be handled from the Milwaukee branch office, and the staff will be augmented to meet increased demands coming from the Milwaukee territory which includes Wisconsin, Minnesota, and the northern peninsula of Michigan.

L. E. Fitzgerald, who has supervised paper mill sales and technical service in the Milwaukee territory for the past 11 years, has been named resident manager at Milwaukee. Mr. Fitzgerald was first employed by the Paper Makers Chemical Corporation at Holyoke (Mass.) in 1927; in 1928 he was transferred to Carthage (N. Y.) where he served as a technical representative until 1934. In that year he assumed the supervision of sales and technical service in the Milwaukee territory.

The headquarters of the newly established district sales office will be located at 5228 N. Hopkins Street, Milwaukee, where the company has a plant manufacturing rosin size and emulsions.



L. E. Fitzgerald

Thomas E. Dial Honored for 30-year Service Record

On completion of 30 years with the company, Thomas E. Dial (center), paper-mill specialist in the central marketing division of Socony-Vacuum Oil Company, Inc., was guest of honor at a dinner given him by his associates in New York City. T. E. Richards (shown at right), of the division's headquarters staff, is presenting the service emblem to Mr. Dial, while Don Beisel, also of the headquarters staff, is about to present a suitably engraved wrist watch as a reminder of the good wishes of Mr. Dial's friends.

D. P. BROWN MADE SALES MANAGER OF BROWN CO.

Announcement has been made that Downing P. Brown, who has been acting temporarily as sales manager for the Brown Company, Berlin, New Hampshire, has been appointed permanently to that position. As vice president in charge of sales, Mr. Brown will be located at the general sales offices at 500 Fifth Avenue, New York City.

After serving for many years as sales manager of the Towel Division of Brown Company, John H. Leo has resigned. He will be succeeded by Gilford F. Henderson, who will also continue as sales manager of the Paper Division.

◆

IMPORTANT CHANGES MADE BY CHROMIUM CORP. OF AMER.

Several changes in its organization are announced by Chromium Corporation of America (New York City).

Ralph E. Cleveland, Waterbury plant manager, and Henderson M. Bell, Cleveland plant manager, have been elected vice presidents.

Donald H. Bissell, secretary of the corporation, has been appointed Chicago district manager.

John B. Allen, eastern sales representative, has been transferred to Chicago as sales manager.

The Chicago plant superintendent is Rolland A. Rahe.

Each of these officials has been associated with Chromium Corporation of America for more than 17 years in connection with the company's industrial chromium plating and engineering service.

◆

▶▶▶ The appointment of *W. E. Dueringer* as assistant sales manager and *H. E. Weaver* as Proposition department manager has been announced by Bailey Meter Company, Cleveland. Both of these gentlemen have been associated with Bailey Meter Company for over 25 years in various engineering and sales capacities. During that time they have solved, successfully, many difficult problems in the application of metering and control equipment. Their combined experience covers a wide range of steam power plants and process industries.

Prevent these 7 profit losses... by micro-organism control with Santobrite*...

Pulp and paper mills constitute a fertile field for micro-biological activities in

1. log storage
2. slime in mill system
3. stored pulp lap
4. rotted felts
5. spoilage of stock
6. spoilage of size
7. mildewing of finished products

And you will find that in each of them there's a way to meet the problem with Santobrite (sodium salt of pentachlorophenol), because destructive micro-organisms are controlled by the proper use of this chemical.

Santobrite is chemically stable, non-corrosive to equipment, non-volatile, comparatively odorless, and when properly handled, is easy and safe to use. How to counteract these activities economically, scientifically, and efficiently is the subject of our technical Bulletin 0-5 ("Santobrite for Micro-organism Control in the Pulp and Paper Industry"), *which is yours for the asking.* MONSANTO CHEMICAL COMPANY, Organic Chemicals Division, 1700 South Second Street, St. Louis 4, Missouri. District Offices: New York, Chicago, Boston, Detroit, Charlotte, Birmingham, Los Angeles, San Francisco, Seattle, Montreal, Toronto.

*Reg. U. S. Pat. Off.

Get this complete SANTOBRITE bulletin

MONSANTO CHEMICALS

SANTOBRITE

for

Micro-organism Control in the Pulp and Paper Industry

MONSANTO CHEMICALS

SERVING INDUSTRY...WHICH SERVES MANKIND

MONSANTO CHEMICAL COMPANY
Organic Chemicals Division
1700 South Second Street, St. Louis 4, Missouri

Please send me, free of charge, Technical Bulletin O-5, "Santobrite for Micro-organism Control in the Pulp and Paper Industry."

*Name*_____

*Company*_____ *Title*_____

*Address*_____

*City*_____ *State*_____

OTTO SIEDER LEAVES WAR DEPARTMENT FOR H. K. FERGUSON CO.

The appointment of Otto F. Sieder as vice president and general manager of The H. K. Ferguson Company, Cleveland and New York engineering and construction firm, has just been announced by A. Kingsley Ferguson, president of that company.

Mr. Sieder was formerly chief of the Industrial Construction Division in the office of the Chief of Engineers of the War Department. During his five years with that department, he had charge of the design and construction of 260 separate plants. For this service, Secretary of War Stimson conferred upon him the Exceptional Civilian Service Award.

Prior to his connection with the War Department, Mr. Sieder was a consulting engineer with offices in New York City. For 20 years he was vice president and chief engineer of the Levering & Carrigues Company, New York, during which time he supervised the design and construction of steel work for some large projects. He remained in charge of all operations of this firm until it was purchased by Bethlehem Steel Company.

◆

JAS. R. LIENTZ IN CHARGE OF SWENSON'S SALES TO PULP AND PAPER INDUSTRY

The appointment of James R. Lientz as consulting chemical engineer of the Swenson Evaporator Company, Harvey, Illinois, in charge of all sales to the pulp and paper industry, has been announced. His headquarters will be at Harvey, Illinois.

Mr. Lientz attended Kansas City Junior College and the University of Michigan, from which he received degrees of Bachelor of Science and Master of Science in Chemical Engineering. During the eight years of his connection with the Swenson Evaporator Company, Mr. Lientz has spent the greater part of his time on the development and sales of equipment for the paper industry.

◆

G. DAVIES PRESTON MADE SALES PERSONNEL MGR. OF SCOTT PAPER CO.

On September 1 G. Davies Preston, assistant to the retail sales manager of Scott Paper Company, Chester, Pennsylvania, became sales personnel manager of the company.

Among the new duties assigned to Mr. Preston is the direction of a training program for Scott's active sales organization and for servicemen returning to that branch of the business.

Otto Sieder

James R. Lientz

G. Davies Preston

Mr. Preston joined the company in 1934 as a member of the quality control department. He later entered the sales organization where he handled a number of important retail sales territories. He has been an assistant to Retail Sales Manager D. A Prouty since October, 1943.

◆

CHANGES AT NIAGARA FALLS LABORATORY ARE ANNOUNCED BY MATHIESON

New appointments at its Niagara Falls Laboratories have been announced by The Mathieson Alkali Works.

Maurice C. Taylor, formerly manager of research, has been appointed resident director of research and development. J. Douglas MacMahon, heretofore, assistant manager of the sales development department, has been named assistant to the technical director. C. N. Richardson, superintendent of pilot operations, becomes manager of research engineering, and C. Gerald Day, a superintendent in the development department, becomes research and plant liaison engineer.

Both Mr. Taylor and Mr. McMahon will report to G. P. Vincent, recently named technical director.

◆

COL. STEVENSON BACK AT HIS WORK WITH BAKER

The Baker Industrial Truck Division of The Baker-Raulang Company, Cleveland, announces that Lt. Col. H. A. Stevenson has returned to his former work with that company—the distribution in the Michigan territory of Baker industrial trucks, tractors, and cranes.

Colonel Stevenson has been retired to inactive duty. He entered the Army in 1942 for the purpose of organizing modern material handling methods and procedures in Army Service Forces installations.

Colonel Stevenson and his associate, Ray A. Bowen, are available at all times for consultation, analysis, and recommendation on material handling problems. Their offices are located at 7310 Woodward Avenue, Detroit 2, Michigan.

◆

GLIDDEN CO. MAKES TWO IMPORTANT PROMOTIONS

In connection with the reorganization of its Chemical and Pigment Divisions, the Glidden Company, Cleveland, Ohio, has announced two important promotions.

J. H. Lathe, western general sales manager, adds to his responsibilities sales management of the Central di-

It's as simple as that!

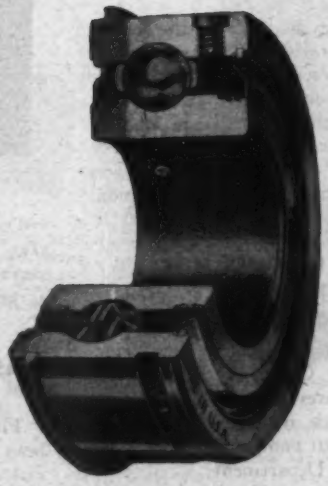
If it's a gun, you simply open the breech—insert the shell or cartridge—close the breech—and you're ready to fire.

If it's a motor or machine, you just slip the "CARTRIDGE" BEARING into its housing—assemble the housing—and you're ready for operation.

Yes—the "CARTRIDGE" BEARING is as complete and self-contained, functionally, as a rifle cartridge or gun shell—fully charged, at the factory, with a heavy load of NORMA "STABILITY-TESTED" GREASE; self-sealed against loss of lubricant or intrusion of dirt.

No fussy fitting—no loose parts—no messy grease "plumbing"—no chance for looseness—no running dry, no wear—

It's as simple as that!



PATENTED

NORMA-HOFFMANN BEARINGS CORP'N. STAMFORD, CONN. *Founded* 1911

Field Offices: NEW YORK • CHICAGO • CLEVELAND • CINCINNATI • PITTSBURGH • DETROIT • LOS ANGELES • SAN FRANCISCO • SEATTLE, WASH.

vision. Mr. Lathe will have his headquarters in Cleveland, and report directly to W. J. O'Brien, vice president, who recently assumed administrative charge of the Chemical and Pigment Division.

C. P. Engelsman has been appointed assistant general manager of the Chemical and Pigment Division. He has been responsible for white lead sales in the middlewestern territory and for white pigment promotion, and now takes over general charge of Glidden's white lead operations and sales.

◆

PEERLESS PUMP REARRANGES TERRITORIAL DISTRIBUTION

In preparation for postwar distribution of water pumps, Peerless Pump Division of Food Machinery Corporation, Los Angeles, has rearranged territorial distribution by the establishment of five sales districts.

Warner G. Vaughan, who for several years was the company's representative in Washington, D. C., has been appointed Atlantic district sales manager, with offices established in Suburban Square, Ardmore, Pennsylvania.

The Southwestern territory has been placed under the management of Charles E. Tierney, with offices in the Blair Building, Decatur, Georgia. Mr. Tierney is well known in hydraulic circles, having devoted many years to pump engineering.

Edward W. Pierce will continue in charge of the Central territory, and as district sales manager is making his headquarters at the company's Canton (Ohio) works.

District sales manager for the Southwestern territory is William Griffin, with headquarters in Plainview, Texas.

B. A. Tucker is Pacific district sales manager, with headquarters at 301 West Avenue 26, Los Angeles. For several years past, Mr. Tucker was manager of the Fresno (Cal.) division.

◆

NEUMANN BECOMES MGR. OF TECH. SERVICE FOR PAPER MAKERS CHEM. DIV.

A recent announcement from Hercules Powder Company, Wilmington, Delaware, states that P. F. Neumann has been made manager of technical service for that company's Paper Makers Chemical Department.

Mr. Neumann, who has been associated with Hercules since 1937 at the company's Kalamazoo (Mich.) plant, has been in Wilmington at the home office since October, 1944, doing sales-service and development work. Prior to joining Hercules, Mr. Neumann was an instructor in chemistry at Michigan State College.

PITTSBURGH PIPE PROMOTES TWO LONG-TIME EXECUTIVES

Two executives, long with the company, have received promotions by the directors of Pittsburgh Piping & Equipment Company.

Gunnar Sinding-Larsen

Gunnar Sinding-Larsen, chief engineer and member of the board since 1938, now assumes the new duties and responsibilities of vice president.

D. M. Weir, Jr.

D. M. Weir, Jr., who has served as sales engineer of the company for 14 years prior to his recent appointment as general manager of sales.

◆

FRASER KEITH NOW V.P. CAN. FORESTRY ASS'N

Fraser S. Keith, of Montreal, has been appointed vice president and special executive officer of the Canadian Forestry Association. It will be his special task to organize co-operation in public forest policy on the part of boards of trade and other business groups, and to bring associations of manufacturers, rural municipalities, professional societies and similar groups, into a working partnership with the Canadian Forestry Association for the advancement of forest conservation.

Mr. Keith, who on July 6, 1945, was elected to the board of governors of McGill University, was for 20 years manager of the department of development, industrial and public relations, of Shawinigan Water & Power Company. He was president of the McGill Graduates Society during 1942-44, having graduated from the University in 1903 with the degree of Bachelor of Science. For eight years he was general secretary of the Engineering Institute of Canada.

His appointment to the executive staff of the Canadian Forestry Association is regarded as recognition of the fact that many influential groups throughout Canada are now ready to cast their weight behind forest conservation and look to the Association for guidance and co-operation.

◆

MARATHON (MENASHA DIV.) REPORTS CHANGES IN ITS JOBBER SALES DIVISION

Recent changes in its Jobber Sales Division have been announced by Marathon Corporation, Menasha, Wisconsin.

Frank Menzel is being transferred from Cincinnati to Chicago where he takes over the territories formerly handled by O. K. Sensenbrenner and Bob Grace. The former resigned to establish his own business; the latter to enter the Navy. William Vaughan, fomerly located at Asheville (N. C.), is moving to Cincinnati to take charge of the territory formerly handled by Mr. Menzel. Erwin F. Graf, Jr., will act as representative in the North Carolina territory.

◆

COOPER FORMS CERTIFIED ALLOY VALVE DIVISION

A new division which will be known as the Certified Alloy Valve Company has been formed by The Cooper Alloy Foundry Company, Hillside, New Jersey. The new company will specialize in the manufacture of stainless steel valves for which it will furnish a certified analysis of every part which comes in contact with liquid. The Cooper company will handle the sale of these products. P. C. Shaffer is chief engineer.

This arrangement brings the entire metallurgical, engineering, and manufacturing process under one roof, including casting, heat-treating, machining and testing. The new division will have all the advantages of Cooper's experience in the design and engineering application of many types of stainless steel valves and fittings.

For Assured Valve Performance

Consult POWELL ENGINEERING *First*

Shooting quail with a bazooka would be nonsensical. But trying to make a valve do a job for which it is not suited doesn't make much sense, either.

For assured performance in flow control the valve *must fit the job.*

That's why Powell maintains a staff of valve engineers who are always at your service for consultation and advice. And if you have any individual flow control problems, Powell Engineering is ready to design the correct valves to meet them.

Fig. 1708—Bronze Globe Valve for 200 pounds W. S. P. Screwed ends, union bonnet, renewable seat and regrindable, renewable, wear resisting "Powellium" nickel bronze semi-cone, plug type disc.

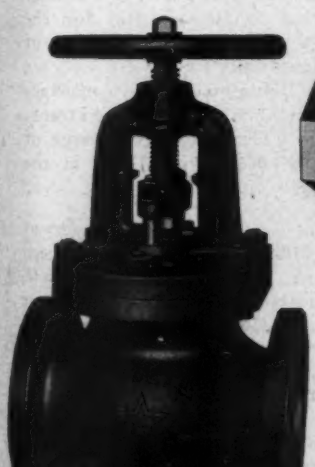


Fig. 241—Iron Body Bronze Mounted Globe Valve for 125 pounds W. S. P. Flanged ends, outside screw rising stem, bolted flanged yoke and regrindable, renewable bronze seat and disc.

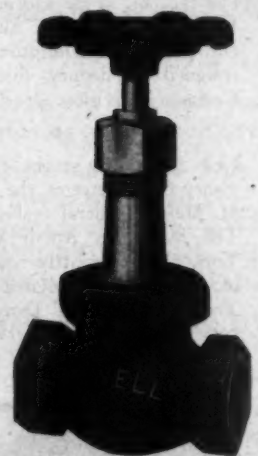


Fig. 190—Iron Body Bronze Mounted Globe Valve for 150 pounds W. S. P. Screwed ends, union bonnet and regrindable, renewable, wear resisting "Powellium" nickel bronze seat and disc.

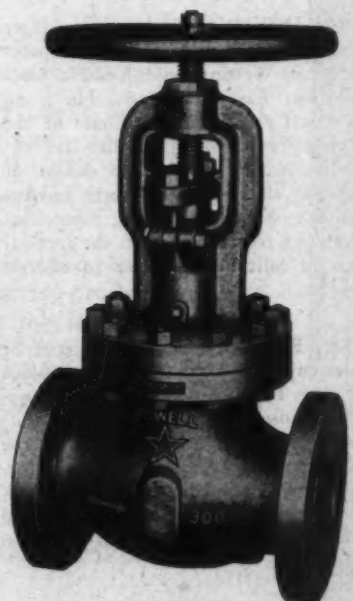


Fig. 3031—Class 300-pound Cast Steel Globe Valve. Flanged ends, outside screw rising stem and bolted flanged yoke.

The Wm. Powell Co.

Dependable Valves Since 1846

Cincinnati 22, Ohio

DISTRIBUTORS IN PRINCIPAL CITIES

POWELL VALVES

A CHIEF ENGINEER'S POST GIVEN TO JAS. DE KIEP BY ELEC. MACHINERY MFG. CO.

The recent appointment of James De Kiep as chief engineer in charge of electrical and mechanical design and development has been announced by Electric Machinery Manufacturing Company, Minneapolis.

James De Kiep

Mr. De Kiep formerly was manager of the a-c. motor engineering department at Westinghouse Electric Corporation, East Pittsburgh. He is an electrical engineering graduate of the University of Michigan, has had extensive experience in the design of rotating electrical machinery, and has written several technical papers including a recent survey on the application of Silicone insulation to electric motors.

◆

▶▶▶ Recently added to the staff of sales engineers at the New York office of the Foxboro Company, Foxboro, Massachusetts, is *Clarence Leslie Williams*, who has been assigned to the Northern New Jersey territory. Mr. Williams is a graduate of Stevens Institute of Technology and has a broad background of diversified business experience.

◆

ANTHONY GARCIA WILL DIRECT EXPORT DIVISION OF INTERCHEMICAL CORP.

The engagement of Anthony Garcia by the Interchemical Corporation, New York City, has been announced by C. A. Richards, director of the Export division.

Mr. Garcia, who was born in Buenos Aires, has spent many years in France and is also well acquainted with the United States. He speaks several languages, including Spanish and Portuguese. Having been associated with Sherwin Williams for the past five years, he has a background of experience in dry colors, inks, varnishes and textile colors.

Mr. Garcia will make a thorough study of Interchemical products before leaving for Argentina and Brazil to make surveys of market possibilities, consult with Interchemical representatives, and to assist them in increasing their outlets.

◆

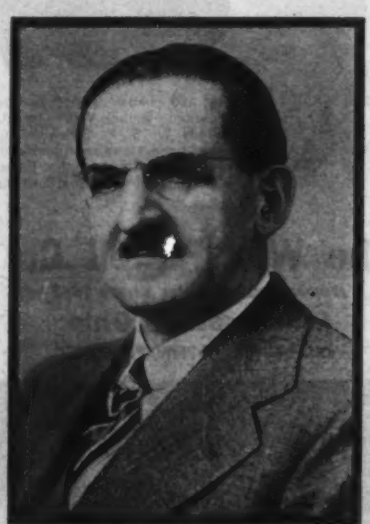
▶▶▶ For the past seven years, *James L. Naylor* has been manager of the Providence (R. I.) District Sales Office of Calco Chemical Division, American Cyanamid Company. Mr. Naylor has now been appointed assistant manager of the Dyestuff Department of Calco Chemical Division, Bound Brook, New Jersey.

◆

▶▶▶ A press release published September 7 announces that Acme Steel Company, Chicago, has appointed *Robert A. Morris* advertising manager. For the past three and one-half years, Mr. Morris has been associated with the WPB in Washington; he recently resigned as deputy director of the Container Division.

◆

▶▶▶ A member of the Tank Car Advisory Committee of the ODT, *Harry M. Mabey*, general traffic manager of The Mathieson Alkali Works (New York City), recently received a letter of congratulation signed by President Truman and ODT Director Johnson for "Distinguished Service in War Transportation."



Harry M. Mabey

MICHIGAN ALKALI DIV. TRANSFERS EDW. HEISER AND G. T. ROBINSON

The appointment of Edward Heiser as manager of the Cincinnati office of Michigan Alkali Division of Wyandotte Chemicals Corporation, Wyandotte, Michigan, has been announced. Mr. Heiser joined the New York sales

Edward Heiser

department of the then Michigan Alkali Company in 1927; he was later transferred to Detroit, and for the past two years has been a member of the Chicago sales force.

G. T. Robinson, formerly manager of the Cincinnati office, has been transferred to Chicago to have charge of the J. B. Ford Division sales in the midwestern area.

◆

▶▶▶ The new personnel manager of Pacific Mills Ltd., Ocean Falls, British Columbia, is *Edward W. Campbell*, Canadian-born and a life-long resident of British Columbia, Mr. Campbell was formerly labor relations officer for the Consolidated Mining and Smelting Company of Canada, Ltd., at Trail, British Columbia. He took over his duties at Pacific Mills Ltd. head office on August 13.

◆

▶▶▶ On October 1 (1945), *Peter J. Abel*, chief of the Regulating Equipment Section, Industrial Instrument Branch, WPB since March 1, 1944, will terminate his connection with that department and again take up his position as Eastern Sales Engineer for the Stickle Steam Specialties Company, Indianapolis, Indiana. Mr. Abel will return to his home at Hudson Falls, New York, and for the time being his address will be 35 Lincoln Street, Hudson Falls, New York.

— there is a "Hooperwood-Engineered" Dryer Felt to answer each specific requirement.

Because no single type of Dryer Felt will suit the needs of all mills — or even all positions on the same machine — WM. E. HOOPER & SONS COMPANY has produced several distinct types of Cotton and Asbestos Felts.

Therefore, for instance, if it is a rugged, heavy felt you need for fine finish in normal production . . . or a lightweight, extra-porous felt for faster drying . . . or an Asbestos felt to withstand the advanced temperatures in high-speed production of Kraft and other heavy papers — HOOPERWOOD "Canvas Engineering" has the answer to your problem.

WM. E. HOOPER & SONS CO.

New York **PHILADELPHIA** Chicago

Mills: WOODBERRY, BALTIMORE, MD.

HOOPERWOOD DRYER FELTS

COTTON AND ASBESTOS

GIRDLER CORP. APPOINTS LESTER HARRISON AS S.E. DIST. MGR. VOTATOR DIV.

Announcement has been made by The Girdler Corporation, Louisville, Kentucky, of the appointment of Lester N. Harrison as southeastern district manager of the company's Votator Division with headquarters at Charlotte, North Carolina.

Mr. Harrison served with the Seabees as a combat diver in the Pacific Theatre, engaging in undersea repair and salvaging operations. He joined Votator in June, 1944, after receiving a medical discharge.

◆

IMPORTANT PERSONNEL CHANGES ANNOUNCED BY PUSEY AND JONES CORP.

The management of The Pusey and Jones Corporation, Wilmington, Delaware, announces the following changes in personnel:

George L. Coppage and Ralph S. Johnston have been appointed vice presidents. Mr. Coppage has been with the company since 1907 and has advanced through many departments to his present position. Mr. Johnson came with the organization in 1911 and has progressed through the Design and Engineering Departments.

Samuel M. Bratton, until recently chief engineer of the Paper Machinery Division, has returned to the organization and has been appointed technical adviser to Sales and Sales Service. Frank M. Sanger has been appointed chief engineer succeeding Mr. Bratton. He is well known in the field of papermaking equipment, having been chief engineer of The Bagley & Sewall Company before joining the Pusey and Jones Corporation in 1939.

◆

▶▶▶ Just announced is the appointment of *Lewis A. (Lew) Harlow* as advertising manager of Fairbanks, Morse & Company, Chicago. Mr. Harlow, after graduating with honors from Harvard University, organized his own publishing house for instruction manuals and textbooks for schools. Becoming interested in radio, he spent a number of years in producing and managing programs. In 1943 he joined Fairbanks-Morse as assistant advertising manager.

◆

▶▶▶ The election of *Harold W. Sweatt*, president of Minneapolis Honeywell Regulator Company, as a director of the Minnesota and Ontario Paper Company, Minneapolis, Minnesota, has been announced by R. H. M. Robinson, chairman of the board of the latter company.

Lester N. Harrison

▶▶▶ From Monsanto Chemical Company, St. Louis, comes the announcement of the appointment of *John E. Gurvin*, plant engineer of elemental phosphorus operations at Monsanto, Tenn., as vice president of Merritt Engineering and Sales Company, Inc., Lockport, New York. The Merritt Company is a Monsanto subsidiary.

◆

E. G. CROSS APPOINTED TO SUPERVISE CROCKER-WHEELER DIV. PRODUCTION

E. G. Cross recently was appointed supervisor of the production planning and control department of the Crocker-Wheeler Division, Joshua Hendy Iron Works, Ampere, New Jersey.

Mr. Cross has had a wide experience in the industrial management field. Early in his business career, he was associated with Merck & Company at Rahway, New Jersey, in their methods and procedures department. Later he went to the Pacific Coast, where he was connected with various shipbuilding and aviation plants.

A graduate of Franklin and Marshall College at Lancaster, Pennsylvania, with an A. B. degree in Economics, Mr. Cross has taken postgraduate work at both the University of California and New York University.

E. G. Cross

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▶▶▶ Just announced by Cameron Machine Company, Brooklyn, New York, is the appointment of *Joseph (Joe) Scheuermann* as sales manager. Mr. Scheuermann has been with the company almost twenty years, the greater part of that time as a salesman in the Midwest and Pacific Coast territory. Lately he has been acting as midwest sales manager. Mr. Scheuerman has many friends among paper mill superintendents, mill managers and other officials in the paper and board manufacturing industries.

◆

RUBERT LINDQUIST IS NEW FINANCIAL V.P. OF STANDARD OIL CO. (IND.)

The Standard Oil Company (Indiana), Chicago, announces that on September 1 Rubert J. Lindquist became financial vice president of that company.

Mr. Lindquist came to Standard Oil from the Curtiss-Wright Corporation where he was vice president, treasurer, comptroller, and a director. His affiliation with Standard management will centralize supervision of financial, accounting and tax affairs in one executive, which affairs are now being supervised by the chairman of the board directly.

Mr. Lindquist had his early business experience in Chicago. In 1932, he went to Washington as chief auditor of the RFC. From 1941-1943 he was vice president and a director of the Reynolds Metals Company. He joined Curtiss-Wright in 1943.

◆

R. A. WILLIAMS NOW EXECUTIVE VICE PRES. AMERICAN C. AND FDRY.

The board of directors of American Car and Foundry Export Company, New York City, recently elected R. A. Williams as executive vice president and as a director. He is also vice president in charge of sales of American Car and Foundry Company.

Mr. Williams will be in direct supervision of sales, subsidiary com-

ONE OF 27 DOW CHEMICALS USED BY THE PAPER INDUSTRY

they put it in writing!

pencil makers pick Methocel as thickener and binder

Methocel has a knack for pointing out easier ways to do things. Example? Ask the pencil manufacturers! Here's how Methocel helped them simplify the preparation of colored crayon pencil leads:

Into these leads must go a wax, a water-soluble pigment, a thickener, and a binder. Alert manufacturers consulted with Dow . . . found that Methocel could take over both the thickening and binding roles—and do them well. Moreover, Methocel would not decompose, eliminating any necessity for adding a preservative.

Today Methocel is the most widely used colored crayon thickener and binder. The wax and coloring matter are simply incorporated into a thick Methocel solution or paste, and leads of smooth, even quality result.

What jobs can *you* do more efficiently with Methocel? As a dispersing medium, thickener, binder, and coating agent, this water-soluble cellulose ether is solving many problems. For full particulars about Methocel, just drop a line to Dow.

THE DOW CHEMICAL COMPANY • MIDLAND, MICHIGAN

New York • Boston • Philadelphia • Washington • Cleveland • Detroit • Chicago
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Methocel

Water Soluble Dow Methylcellulose

DOW

CHEMICALS INDISPENSABLE TO INDUSTRY

panies and foreign representatives of American Car and Foundry Export Company. This company is supplying many spare parts to keep the railroads of Central and South America in operation, and freight cars are being built for Cuba, Costa Rica, Colombia, Ecuador, Peru and Brazil.

Also announced is the appointment of E. A. Lofquist, a graduate of the United States Naval Academy, as a special representative for the ACF sales department. Mr. Lofquist, who until recently has been on active duty as a captain in the United States Navy, will have his headquarters at the Chicago office.

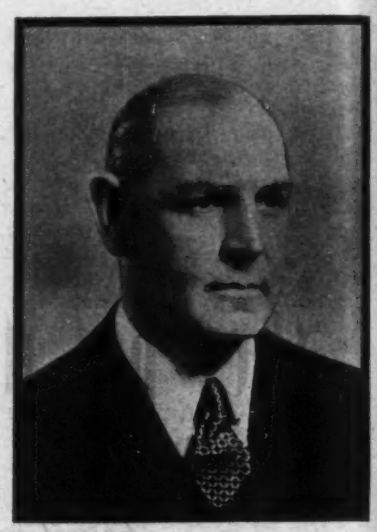
BLAW-KNOX WILL RETAIN SAME MANAGEMENT FOR ITS NEW BUFLOVAK DIV.

The management and personnel of the Buflovak Division of the Blaw-Knox Company, will remain the same as it was before Blaw-Knox acquired the plant, inventory, and uncompleted contracts of the Buffalo Foundry & Machine Company, Buffalo.

In commenting on the purchase of the Buffalo company, William P. Witherow, president of Blaw-Knox and a former president of the National Association of Manufacturers, states: "The acquisition of this property is a further effort to strengthen our company's postwar position in the food, process, and chemical equipment industries—markets characterized by great advance in the past few years and ones which promise unusual postwar activity."

◆

▶▶▶ On August 1, *Hobart C. Ramsey*, executive vice president of Worthington Pump and Machinery Corporation (Harrison, New Jersey), was named president of the Ransome Machinery Company, subsidiary of Worthington in Dunellen, New Jersey.

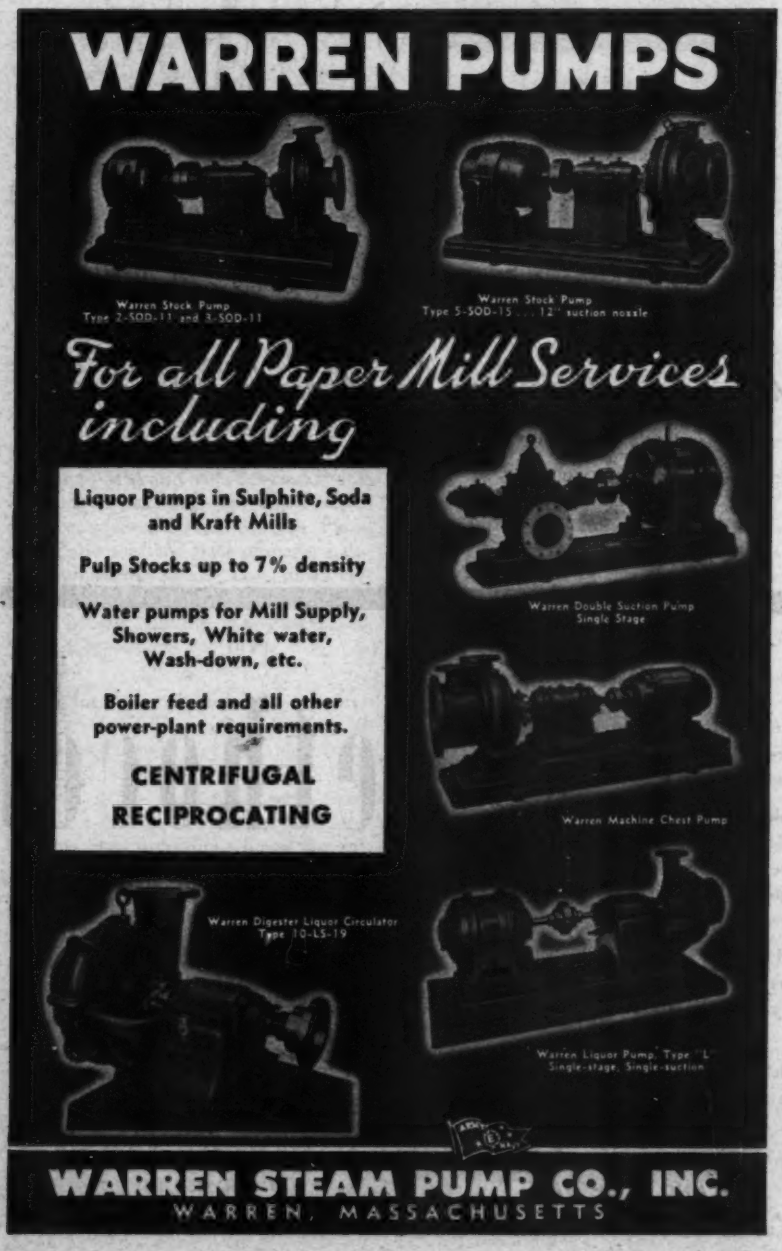


Hobart C. Ramsey

◆

▶▶▶ Manager of the Stainless Steel Division is the promotion given to *W. L. O'Brien* by Jessop Steel Company Washington, Pennsylvania. In 1943, Mr. O'Brien joined the Jessop company as district manager in Indianapolis, Indiana. Previously he was a metallurgist at the Carnegie-Illinois Steel

W. L. O'Brien


WARREN PUMPS
Warren Stock Pump
Type 2-SOD-11 and 3-SOD-11
Warren Stock Pump
Type 5-SOD-15 . . . 12" suction nozzle
For all Paper Mill Services including
Liquor Pumps in Sulphite, Soda and Kraft Mills
Pulp Stocks up to 7% density
Water pumps for Mill Supply, Showers, White water, Wash-down, etc.
Boiler feed and all other power-plant requirements.
CENTRIFUGAL
RECIPROCATING
Warren Double Suction Pump
Single Stage
Warren Machine Chest Pump
Warren Digester Liquor Circulator
Type 10-LS-19
Warren Liquor Pump, Type "L"
Single-stage, Single-suction
WARREN STEAM PUMP CO., INC.
WARREN, MASSACHUSETTS

Mills. Also he has worked in the research departments of both the American Can Company and the Continental Can Company. His headquarters will be in Washington (Pa.)

◆

▶▶▶ Newly appointed control superintendent at Anglo-Canadian Pulp and Paper Mills, Ltd., Quebec City, is *Ross Moore.*

◆

▶▶▶ One of the foremost figures in the American chemical industry for 40 years, *Gaston F. DuBois,* vice president and member of the Executive Committee of Monsanto Chemical Company, St. Louis, retired on September 1. He will continue as a director and also will serve as a consultant to the company. Mr. DuBois was awarded the Perkin Medal in 1943 in recognition of his outstanding work in applied chemistry by the American Section of the Society of Chemical Industry.

Necrology

JOHN B. BERRYMAN

Chairman of the board of directors since 1935, John B. Berryman, of Crane Co., Chicago, passed away August 10 at the age of 83.

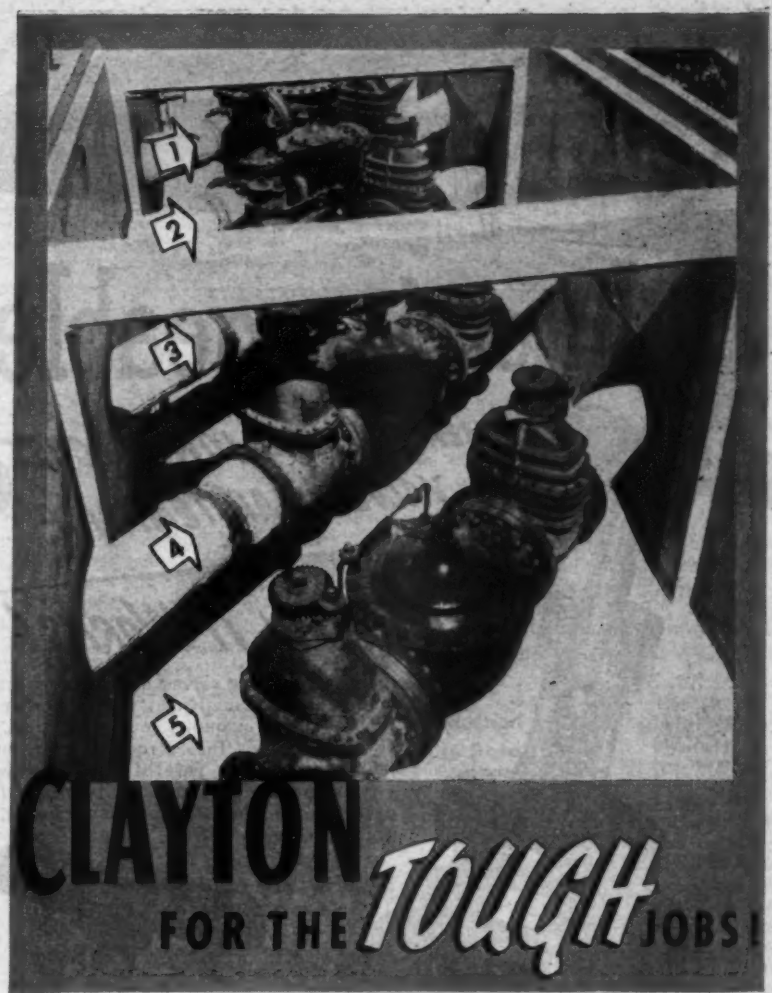
Mr. Berryman had been with Crane Co. for 53 years. He became associated with the company in Minneapolis where he started as a bookkeeper in the plumbing supply business which later became Crane's Minneapolis branch. Later he was made manager of the company's newly created engineering sales department in Chicago, and he advanced through the ascending official positions until he was made president in 1932.

◆

▶▶▶ Widely known throughout the process industry, Philip H. Noyes, of Oliver United Filters, Inc., passed away August 18 in Chicago. He was 43 years of age. Mr. Noyes joined the company in 1937 as technical filtration engineer, first in the Western Sales Division at San Francisco. For the past several years he has been in the Chicago sales office.

◆

▶▶▶ A former secretary of Case Brothers, paper manufacturer of Manchester, Connecticut, *Albert L. Crowell* passed away July 26 at the age of 77. Mr. Crowell retired in 1927. He had become associated with the Case company in 1894, and he served consecutively as vice president, treasurer, and secretary.



Do you have a problem involving pressure control in 2" to 16" lines carrying water, oil or gas? Does that problem involve a wide drop in pressure—or is it within critical limits of only a few inches of water?

CLAYTON Pressure Reducing Valves may be the answer. Shown above is an installation of 5 Clayton Pressure Reducing Valves on 16" lines which handle a pressure drop from 280 lbs. PSI to 160 lbs. PSI. In other installations, Clayton 16" Pressure Reducing Valves are handling reductions as limited as from 9 inches to 4 inches of water.

Write for Clayton Recommendations to fit Your Requirements. Representatives in Principal Cities.

VALVE DIVISION

CLAYTON

"Feather Touch" CONTROL

CLAYTON MANUFACTURING COMPANY ALHAMBRA, CALIFORNIA

Interchangeable Parts

MEAN EASIER, LOWER COST VALVE MAINTENANCE

HERE'S HOW IT WORKS!

Fig. 1021
150 lb. S. P.
Iron Body
"FERRENEWO"
Regular Type

All parts of the valves shown here (except bodies and bonnet rings) fit each other perfectly. If, for example, you need a stem, disc, or seat ring for the "Renewo", you can use the corresponding part of the "Ferrenewo" —*it is exactly the same.* This means fewer parts to be carried, speedier repairs, and greater ease in making them.

Fig. 73-P
200 lb. S. P.
Bronze
"RENEWO"
Plug Type

Fig. 73
200 lb. S. P.
Bronze
"RENEWO"
Regular Type

● Maintenance men can give you a flock of reasons why they prefer LUNKENHEIMER quality-built Valves. Prominent among those reasons is the *wide* interchangeability of parts made possible by Lunkenheimer's highly developed simplicity of design and precision workmanship.

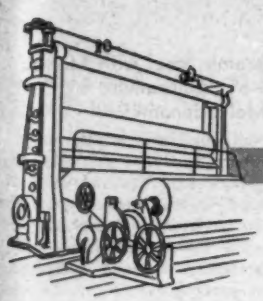
In the "Renewo" and "Ferrenewo" Valves, this interchangeability has long been of highest practical value to industry, in making valve maintenance easier, speeding production, lowering costs. And — vitally important today — *saving fuel* that comes from tight valves.

The Lunkenheimer Co., Cincinnati 14, Ohio, U. S. A. Branch Offices: New York 13, Chicago 6, Boston 10, Philadelphia 7. Export Department: 318-322 Hudson St., New York 13, N. Y.

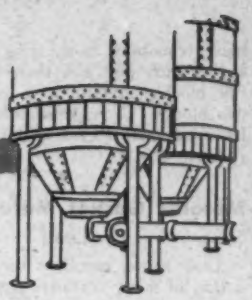
Lunkenheimer Distributors are located in the principal industrial centers. There is one near you. Call on him— you'll find him equipped with a COMPLETE STOCK of parts that will make Lunkenheimer "interchangeability" a time-saving, labor-saving, money-saving FACT in your plant!

LUNKENHEIMER VALVES

BRONZE, IRON, STEEL AND CORROSION RESISTANT ALLOY VALVES, 125 TO 2500 LB. S. P.; BOILER MOUNTINGS, LUBRICATING DEVICES, AIRCRAFT FITTINGS



Practical SHORTS



Readers are invited to submit short, practical articles for this department. The items should be original and should relate to ways and means of handling production and maintenance jobs. Where possible, articles should be illustrated. Rough sketches only are required. Payment will be made for acceptable items upon publication.

Fourdrinier Wire Tension and the Stretch Roll

One of the most important factors in fourdrinier wire life is the tension at which a wire is operated. Tension in a wire is not the same at all points. It is greatest between the last suction box and the couch roll due to the accumulated braking loads of suction box friction, breast roll and table roll friction and stock load friction. Wire tension is least between the last supporting roll and the breast roll.

What is the proper running tension of a wire? It should be equal to that tension which will prevent wire slippage on the couch roll. Probably more wires are run too slack than too tight. If a wire is run too slack, it will slip on the couch roll and wear out rapidly. The more the wire slips the faster it will wear out. Remember that the wire is slipping with metal to metal contact on the couch roll where lubrication from water and stock is at a minimum and where wire tension is at a maximum.

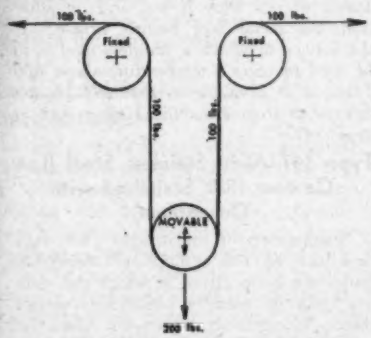


Figure 1

Tension in a wire is controlled by the stretch roll. In their present form, however, stretch rolls do not properly control tension. They subject a wire to tension but give no measure of, nor do they maintain, the correct tension. At present the very important factor of tension is determined by feeling or slapping the wire and in this way trying to determine whether or not the tension is correct. It is humanly impossible to obtain a close approximation to uniform tension in this manner.

It is also impossible to run successive wires at the same tension by marking the position of the stretch roll and always running it at the same position. This is due to the fact that all wires vary slightly in length and even a difference of one-quarter of an inch in length can mean a great difference in tension.

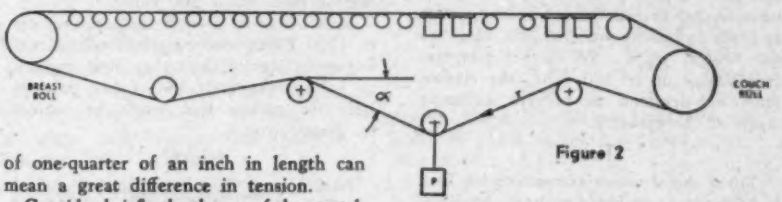


Figure 2

Consider briefly the theory of the stretch roll which essentially is the theory of the two fixed pulleys and one movable pulley as shown diagrammatically in Figure One. To maintain a tension of 100 pounds in a cable, the pressure or weight at the movable pulley should be 200 pounds. Actually the theory is complicated in practice on the paper machine because of the introduction of a variable angle (designated by the alpha symbol) as illustrated in Figure Two. The angle varies because the length of the wires vary. As the angle increases, the pressure (P) necessary to maintain a given tension (T) becomes greater. For example: Take a 100 inch wire and assume a required tension of 15 pounds per inch of width. Then at an angle of 5 degrees, the pressure (calculated by using the formula $P = 2\,T \sin \alpha$) on the stretch roll is only 261 pounds. If the angle increases to 15 degrees, the pressure required is 776 pounds.

These calculations show that stretch rolls which are counterweighted do not maintain uniform wire tension unless wires are of uniform length.

To obtain best results, a fourdrinier wire should be operated at the proper tension to overcome slippage on the couch roll, and this tension should be maintained constantly throughout the life of the wire. —Eastwood-Nealley Corporation.

◆

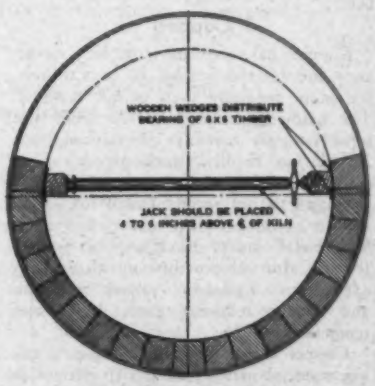
How Can a Motor or Generator Be Protected from Overloads?

Machines can be protected from overloads by providing some means of disconnecting them automatically when the currents reach a dangerous value, generally about 125 per cent of full-load current. Generators usually have circuit breakers which can be opened manually or by overload relays. Small motors are protected by fuses, and large ones by overload relays on the starting devices, or by fuses and circuit breakers at the line switch. When relays are used, they are often provided with time-delay features so that the circuits will not be opened by overloads of short duration that would not injure the motor. The inverse-time feature is often used; this means that for a slight overload, there is a long delay before opening and the greater the overload the shorter the delay; for an extremely large overload, the circuit breaker opens instantaneously.—*Catechism of Electrical Machinery*, Fairbanks, Morse & Co.

◆

Method of Jacking Lining in Rotary Kiln

A preferred method of lining (a rotary kiln) consists of laying approximately 10 feet of lining up to a point slightly above the kiln axis, next, of bracing the top liners on each side with heavy timbers, and then, of holding these timbers firmly against the brick with jacks or trench braces. (See Figure). The kiln is then turned one-fourth revolution and additional blocks are laid to a point slightly above the kiln axis and braced. The next quarter turn of the kiln brings the remainder of the lining into such a position that keying of the final brick in each ring can be accomplished very conveniently. Standard rotary kiln blocks are made to have a 9-inch outer chord and an inner chord of the proper length to permit the liners to turn the circle of the kiln. However, it is necessary in almost all cases to cut the final block in order to obtain a tight ring. Best practice dictates that in no case should this final key be less than one-half of a full block. Accordingly, when the



space remaining in the ring for the final key is such that less than one-half of a full block is required, it is best to cut two blocks. C. A. Brashares, THE PAPER INDUSTRY AND PAPER WORLD, 23 No. 12 (March, 1942).

◆

Metallic Gasket Materials

Lead

Lead shows excellent resistance to the action of many corrosive agents and finds wide application as a gasket in the chemical and allied industries where temperatures do not exceed that of boiling water, and the solutions handled are close to the neutral point. For higher temperature service up to 400 Fahr., the closure must be designed to prevent excessive creep of the gasket.

Tin

Tin is useful where extremely pure neutral solutions and foods are to be handled. It is strongly attacked by acids and alkalies. Under some conditions, it may be used at temperatures up to 400 Fahr., but is generally not recommended for service over 200 Fahr.

Aluminum

Pure aluminum is widely used as a gasket material, and its resistance to corrosion is due to the presence of a protective film formed either by oxidation or by reaction of the aluminum with the corrosive fluid.

The protective coatings are attacked by strong acids and alkalies, but their resistance is sufficient to allow the use of aluminum in a variety of services.

Because of its protective oxide coating, aluminum may be used at temperatures up to 800 Fahr.

Its resistance to the hot sulphur-bearing gases encountered in the petroleum industry account for its popularity in this field.

Copper

Copper has excellent corrosion resistance and for this reason, is, next to iron, the most generally used gasket material. The oxidizing acids, wet ammonia, and some strongly corrosive substances, such as chlorine, readily attack copper, as do sulphur and the sulphur compounds.

Copper is not recommended for gasket service at temperatures above 600 Fahr. This metal, unless dioxidized, or oxygen-free, is also subject to embrittlement by exposure to hydrogen, carbon monoxide and similar reducing gases at elevated temperatures.

Copper is not generally used as a gasket material in steel flanges if electrolysis can take place.

Brass

The common brasses act very much like copper in their resistance to corrosion. The high zinc alloys are subject to dezincification and in some instances to corrosion cracking, but proper selection of the alloy will guard against the former, and the latter may be eliminated by close fabricating controls.

The brasses are not used for gasket purposes at temperatures much above 600 Fahr.

Monel

Monel metal, because of its resistance to most acids, alkalies and other corrosive agents, both at normal and elevated temperatures, may be considered as one of the most versatile gasket materials.

Monel should not be used with the strongly oxidizing acids, such as nitric, nor with strong concentrations of hydrochloric acid. However, it is excellent for handling anhydrous hydrofluoric acid at elevated temperatures. Monel is subject to embrittlement when exposed to sulphur-bearing gases above 500 Fahr.

Monel may be used at temperatures up to 1500 Fahr., under certain conditions. For steam service the upper limit appears to be approximately 800 Fahr., particularly for gaskets that might be subject to stress-corrosion.

Nickel

Nickel does not have the all-around excellent resistant properties of Monel metal, but it does have definite advantages such as, for example, the ability to handle chlorine at temperatures up to 950 Fahr.

Nickel is subject to embrittlement by steam at temperatures above 800 Fahr., particularly if under stress. In oxidizing atmospheres, this metal is useful up to 1400 Fahr., and under controlled conditions, may be used even higher.

Silver

Silver is resistant to alkalies, to organic acids, and to certain concentrations of hydrochloric and other mineral acids. Since its resistance to corrosion does not depend upon a protective oxide film, it may be used where such a film would be destroyed.

Wet corrosive gases such as hydrogen sulphide, and the chlorine group, attack silver readily.

Silver may be used at up to 1200 Fahr., but must be reinforced at elevated temperatures to restrict creep of the material.

Platinum

Because of its initially high cost, platinum is used as a gasket metal only when no other material is available that will resist the corrosive action present.

Platinum's low oxidation rate allows its use in ordinary atmospheres at temperatures up to 2300 Fahr.

Ingot Iron and Low Carbon Steel (SAE 1010 to 1020)

Iron and low carbon steel are not suitable for handling dilute acids or aqueous solutions of salts in the neutral or acid range. A high rate of failure may be expected for these materials used even in hot water service, if the metal is highly stressed. Concentrated acids and most alkalies have little or no action on these materials, however, and iron and steel gaskets are regularly used for these services.

The upper temperature limit for iron gaskets is approximately 1000 Fahr., particularly if the conditions are oxidizing. At this temperature, steam will break down in contact with the iron and the rate of oxidation increases rapidly. Reducing gases carrying sulphur are strongly corrosive at temperatures above 600 Fahr.

Type 502 Chrome Steel with Molybdenum (4-6% Chromium, 5% Molybdenum)

This alloy, although not widely used outside of the oil industry, is particularly suitable for installations requiring resistance to oxidation at temperatures up to 1200 Fahr. Its general corrosion resistance is somewhat better than iron.

Its use at present is confined solely to ring type joint gaskets.

410 Chrome Steel (11-14% Chromium)

This alloy, because of its ability to resist oxidation at temperatures up to 1300 Fahr., is used to some extent for certain specific gaskets installations, but the 18-8 type stainless steels are generally more readily available and in most instances would be preferable.

Type 304 Alloy Stainless Steel (Low Carbon 18-8)

This alloy is the standard stainless type chromium nickel steel and it is used most extensively for gasket service under corrosive conditions.

Except for their inability to resist the attack of sulphuric acid and the halogens (chlorine, fluorine, etc.) particularly when wet, the 18-8 type stainless steels may be used in many services that cannot be handled by any other material.

The type 304 alloy is made susceptible to so-called intergranular corrosion only when it has been held at a temperature of from 800 to 1500 Fahr. for a length of time sufficient to allow the material to become unstable. In this unstable condition, much of the corrosion resistant ability of this alloy is lost and, in addition, the metal may become brittle. If the service in which a stainless steel is to be used involves a temperature above 800 Fahr., it is advisable to provide a gasket fabricated from a stabilized alloy such as type 347.

Type 347 Alloy Stainless Steel (Low Carbon 18-8 Stabilized with Columbium)

Stabilization of the straight 18-8 stainless steel by the addition of columbium raises the temperature at which the material may be used in continuous service. Since intergranular corrosion does not take place in the stabilized alloy, it may be used safely up to 1700 Fahr.

The addition of the stabilizing agent does not result in any appreciable increase in the resistance of the alloy to corrosion as compared to the type 304, and its use as a gasket material is generally limited to services above 800 Fahr. where the unstabilized alloy would not be suitable.

Type 316 Alloy Stainless Steel (Low Carbon 18-8 with Molybdenum)

The addition of approximately 2 per cent of molybdenum to the straight 18-8 alloy increases its strength at elevated temperatures and results in somewhat improved corrosion resistance.

This material is subject to intergranular corrosion if exposed to temperatures within the critical range of 800 Fahr. to 1500 Fahr.—GOETZE GASKET & PACKING CO., INC.

Cleaning and Dressing Leather Belts

Keep belts as clean as possible at all times for best results. If machine bearings are throwing oil or grease, these substances will get on the belt, reducing its life and pulling power.

If leak cannot be stopped at the source, the installation of deflectors or throwing discs will be helpful.

A small amount of oil on a belt can sometimes be removed by ordinary wiping. If this does not do the job, give it a thorough scrubbing with a solution of carbon tetrachloride and unleaded gasoline, using a stiff jute brush and working in the direction of lap joints so as not to lift them but rather lay them down, or

Remove belt and soak it for five or six hours in a degreasing solution consisting of one part carbon tetrachloride to three parts of unleaded gasoline. If carbon tetrachloride is not available, the belt can be soaked in any of the cleaning fluids used by dry cleaning establishments. Due to the fire hazard, the soaking of the belt should be done in the open or where ventilation is good. After removing from the bath, allow belt to dry thoroughly.

Leather belting should always be redressed after cleaning.

Use a belt dressing approved by the belt manufacturer and designed to supply the necessary currier's oils which were lost in use or during cleaning.

When pulley faces begin to polish, it is a sign that dressing is needed on the belt. Under normal conditions, dress belts every three to six months.

If cemented laps show signs of opening, stick them down immediately.—American Leather Belting Association.

◆

Care of Portable Electric Drills

Every portable electric drill is designed to a maximum drilling capacity, and the use of over-size bits is certain to cause overload and motor burn-out. Consequently, the practice of turning down shanks to get an over-size bit into a chuck of smaller capacity can only result in unnecessary breakdown. Keep bits sharpened properly to insure fastest drilling.

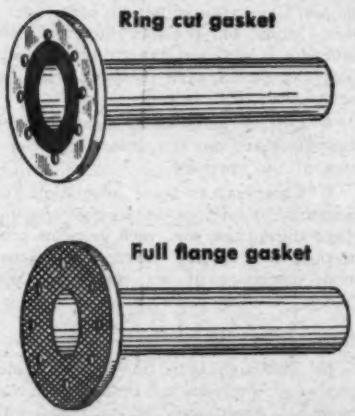
Most drill chucks are actually precision instruments and should be treated as such. Their firm true grip on the bit (essential to perfect drilling) can be maintained indefinitely with proper care. Use proper size chuck key—*and no other tool*—for tightening and loosening the chuck. For most accurate chucking, first run jaws out until the bit is held firmly and then tighten each jaw individually. When drill is not in use, keep jaws retracted so they are not exposed to blows or bumps. Excessive bumping also can reduce drilling accuracy by damaging the precision-ground, threaded spindle on which the chuck is mounted.—Skilsaw, Inc.

◆

How to Seal Pipe Flanges

A *ring cut* gasket, properly applied, does a better job than a *full flange* gasket. Here are a few hints that will help:

1. Make sure flanges are perfectly clean and true.



2. Use as thin a gasket as possible for the particular flange condition. (The rougher the flange surfaces, the thicker the gasket needed.)

3. See that the gasket is properly centered and does not project inside the flanges.

4. Pull up the flanges evenly and tightly, alternating from side to side to insure even pressure all around.

—Johns-Manville.

◆

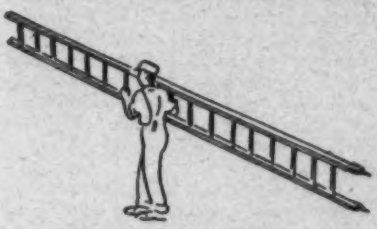
Carrying Straight Ladders

Many accidents are caused by people colliding with the ends of ladders being carried. These are serious enough ordinarily, but when the ladders are equipped with spiked safety shoes, they may be fatal.

When carrying a ladder:

1. Be alert for the unexpected appearance of someone in your path.

2. If ladder is light enough for you to handle it alone, carry it with the safety



feet to the rear and the front end elevated so it will be above the head of anyone in front of you.

3. If the ceiling is low, carry the ladder at your side with safety feet to the rear and grasping it by the rail. Be extra careful when approaching doorways and going around corners.

4. If two of you are carrying a long ladder, carry it with each man close to the ends of the ladder so that neither end will project far enough to be dangerous.—*Safety Instruction Card No. 202*, National Safety Council.

◆

To Keep Goggles From Fogging

Safety goggles and face shields, whether of glass or transparent plastic may be kept clear and substantially free from fogging if dry soap is rubbed on the surface and then polished with a lint-free cloth or other suitable tissue. This idea forms the basis of a patent (U. S. 2,333,794) for making soap-impregnated tissues for smultaneously cleaning of and applying an anti-mist film to glass surfaces or the like.—Association of American Soap & Glycerine Producers.

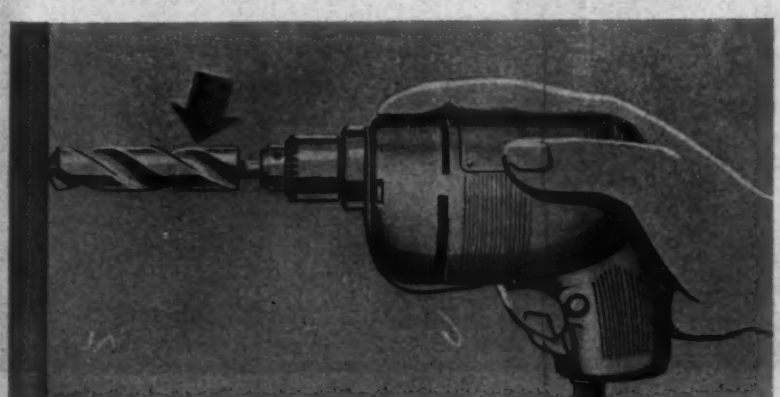
◆

Lifting Spreader for Industrial Truck Batteries

In industrial cycle service where more than one battery per truck is provided, the trend is to have a hoist in the battery room which is used to transfer the battery between the box and the charging rack. A lifting device for this purpose so designed that the lifting force is directly up from each lifting eye in the battery tray is preferable to a sling arrangement in which the lifting hooks pull toward the center, especially for the lifting of the heavier size batteries, thus preventing warping of the tray and possible resultant damage to jars or sealing.

In the design of the lifting device, there is an advantage in insulating the hooks from each other.

So as to prevent accidental shorting of the cells or battery when using a lifting device, some operators place a protective mat or cover on top of the battery during this operation. Mats of rubber, cardboard or plywood, in fact any lightweight insulating material, may be used for this purpose. — *Philco Storage Batteries*, Philco Corporation.



Elements of an Industrial Safety Program

The principal unit in industrial accident prevention is the individual company, plant or establishment. Upon its actions, more than on any other influence, depend the safety of its workers and, in the aggregate, the reduction of the national industrial accident toll. The companies which had the most effective programs and the best records before the war had the least difficulty in adapting these programs and maintaining these records when they shifted to war production. The same will be true as they return to normal operation.

It cannot be too strongly emphasized that the basic program is and must be the same as that worked out through thirty years of pre-war experience. This experience, in far greater detail than can be outlined in this report, applies in essentials to industries of every character and is available to all of them.

An effective safety program must have the wholehearted support of top management. The management must recognize that accidents are expensive and, with rare exception, unnecessary and preventable; that accident prevention aids production efficiency and economy; that a good safety program promotes good employee and public relations; that safety is a non-controversial subject on which management and workers can work together to mutual advantage. This management policy must be made clear to all executives and employees, and top management must show continuous interest and take active part in the safety program.

Employee acceptance and co-operation also are essential. It is therefore advisable that employees be given an opportunity to assist in preparing the program, to offer suggestions, and to participate and co-operate to the fullest extent.

On these essential bases, the main elements of an effective program, with special reference to post-war problems, are as follows:

*From *Industrial Safety Tomorrow*, a pamphlet published by the National Safety Council for 38 national organizations interested in industrial safety.

Safety Organization

1. Placing responsibility on "line" executives—managers, superintendents, foremen and other supervisors—for the safety of employees working under their direction.

2. In larger plants, a competent full-time safety director with adequate staff, facilities and budget, acting in an advisory capacity to "line" executives and supervisors; in smaller plants, a part-time safety director, combining this responsibility with personnel or other allied functions; in even the smallest plant, designation of some individual to be responsible for safety activities.

3. Continued training of the safety director so that the program may be kept in step with new developments and techniques. Close association with other safety men, study of available literature, attendance at local and national safety meetings and participation in special training courses will all be helpful.

4. One or more safety committees of executives and workers, suited to the nature of the operation.

5. Continuation and adaptation to peacetime conditions of services inaugurated during the war, such as plant protection, fire fighting, emergency evacuation, inspection of fire equipment, and first-aid training.

Inspections

6. Thorough initial inspections to detect unsafe practices and conditions so that remedial action can be planned, with special attention to:

—overworked machines and guards
—obsolescent machines, guards, safety equipment
—temporary equipment or substandard condition necessitated by wartime operation

Accident Records

7. Accurate records of all accidents resulting in personal injury or death and, where possible, of all "near accidents," using standard definitions and tabulations.

8. Use of such records to guide the accident prevention program, including study of the statistics and of individual accident reports to determine trends, predominant types and causes, and best methods of prevention. Accident statistics, showing as accurately as possible the economic and other costs of accidents, are particularly necessary to re-establish the principle that organized accident prevention in every plant is an economic necessity.

9. Accident investigation by committees or qualified individuals, with special attention to locating and eliminating accident causes directly related to reconversion.

First-Aid and Medical Facilities

10. Provision for adequate first-aid facilities in plants of all sizes, with nurses or doctors serving in larger organizations.

Buildings and Grounds

11. Checking all plans and specifications for safety *before* constructing, remodeling or adapting any plant, building, structure or part thereof. Such items as the following should be considered:

a. General plant layout for convenient and safe movement of men and materials

b. Railroads, docks, wharves, roadways, walkways and parking lots—grades, grade crossings, pavement width, clearances, signs and markers, railings, drainage and the like

c. Buildings—structural strength, fire resistance, floor surfaces, adequate and safe stairways and exits, railings, safe access to all points, provisions for cleaning etc.

d. Heating, ventilation, exhaust systems.

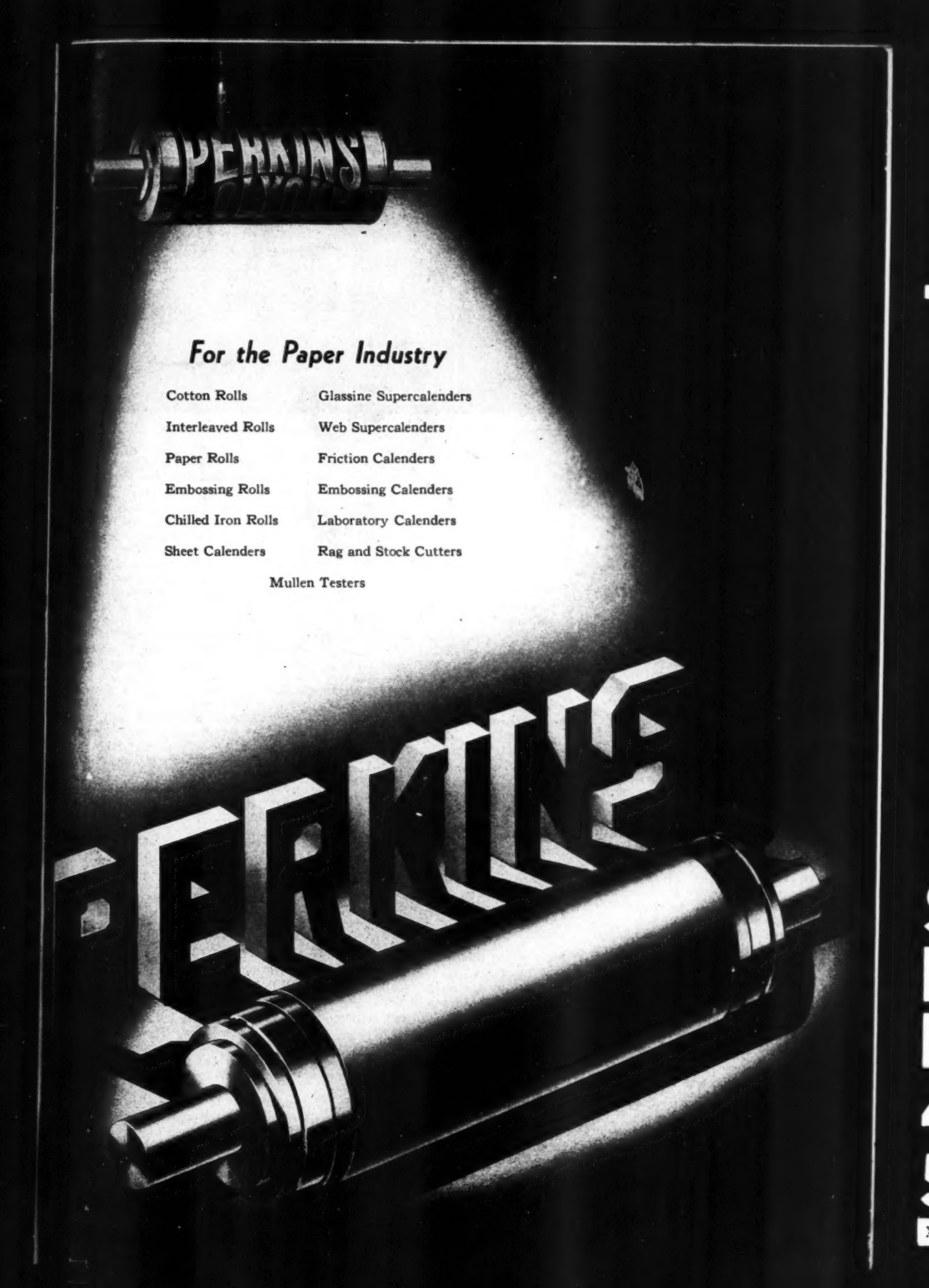
e. Lighting, both natural and artificial, in yards as well as in buildings

f. Boiler and engine rooms, generators, switchboards and other electrical equipment, including access, exits and clearances

g. Elevators, cranes, derricks, hoists, conveyors

h. Mechanical power transmission—controls, guards, accessibility

LEFT—Safety committee in action. . . . RIGHT—Inspection is the foreman's responsibility.


PERKINS
For the Paper Industry
Cotton Rolls
Interleaved Rolls
Paper Rolls
Embossing Rolls
Chilled Iron Rolls
Sheet Calenders
Glassine Supercalenders
Web Supercalenders
Friction Calenders
Embossing Calenders
Laboratory Calenders
Rag and Stock Cutters
Mullen Testers
PERKINS

LEFT—New employees need special training. RIGHT—Attractive reminders keep employee interest alive. . . .

i. Departments using flammable, explosive or other hazardous materials—special attention to segregation, design, exits, and the like

j. Sanitation, including toilet, locker and washrooms, drinking water, etc.

k. Lunchrooms, recreation and meeting rooms

12. Careful check of buildings, especially if "temporary" or obsolescent, for structural strength, fire protection, adequate exits, and avoidance of overloading or overcrowding.

13. Compliance with building codes and other legal standards and with the safety codes developed under the auspices of the American Standards Association and other recognized technical organizations.

Machinery, Guards and Equipment

14. Careful check of blueprints and specifications *before* purchase or installation, for compliance with safety regulations and standards, and suitability for the use intended.

15. Inspection of all existing machinery, and equipment for defects and unguarded moving parts.

16. Overhauling of all machinery, equipment and protective devices deteriorated through lack of maintenance or through disuse.

17. Particular attention to equipment procured or remodeled for new processes and operations, based on study of special accident, fire and health hazards involved.

18. Careful check of used machines or equipment purchased on the open market or from other plants, on which guards and safety devices may be missing or ineffective, or which may be in poor condition.

Personnel Election and Training

19. Proper placement of employees for efficiency, safety and morale through the use of physical examinations and aptitude tests.

20. Supplementary use of job analyses of every job in the plant, to ensure fitting the man to the job. The analysis should cover the special hazards involved, if any, and the physical and mental qualifications needed for doing the job efficiently and safely.

21. A training course for the new employee, coupled with adequate supervisory instruction, to familiarize him with the plant safety program, with the specific hazards of his job and with methods of avoiding them.

22. Orientation training for the employee transferred from one job to another, to teach him how to do the new job safely.

23. Full utilization of training courses offered by government agencies, schools, colleges and others, with a continuation of streamlined safety courses for foremen and safety committees with more effective use of visual aids.

More than 80 per cent of all accidents involve some element of human behavior. The large-scale shifting of workers, within a plant or industry and among industries, offers an unparalleled opportunity for correct placement and training. Safety can be built into a new or remodeled working force, just as it can be built into a new or remodeled building or machine. Advance planning and wise execution of a placement and training program will greatly increase the effectiveness and reduce the cost of subsequent continuing safety activities.

Maintaining Interest

24. Publication of comparative accident records and trends, inter-company, interplant and inter-department, as a continuing incentive to managers, superintendents, and foremen.

25. Continuous reminders and information for workers and others on the personal importance of avoiding accidents, the causes of accidents and how to avoid them, through posters, films, plant publications, service on safety committees, attendance at safety meetings and similar methods.

26. Incentives to department and to individual workers through contests and awards.

Re-employment of Service Men and Women

27. Recognition that the veteran urgently desires to return to normal civil life and to be treated the same as any other citizen; that in most cases he is in no greater need of "rehabilitation" than is the civilian who changes suddenly from one environment to another. In both cases, sympathetic tolerance and understanding are needed during the initial period of readjustment.

28. Recognition of skills, maturity and leadership experience gained in military service; careful attention to correct placement of the returned veteran, to give him the job he is best fitted for and the best job he is fitted for.

29. Complete co-operation with the Army, Veterans Administration and other government agencies concerned with the return and rehabilitation of service men and women.

30. In the infrequent cases of serious prolonged mental or physical disability, expert handling of each individual case by a competent psychiatrist or physician, or referred to a government agency.

Workers physically or emotionally not fitted to their jobs, or to any job, have always been a source of expense, delay, and inefficiency. Attention should be focused not on the veteran as such, but on the proper placement, training, and supervision of all workers, and particularly handicapped workers, regardless of the origin of the handicap.

Off-the-Job Safety

31. Off-the-job safety activities fitted into the regular safety and health activities of the establishment. These present an excellent opportunity to vary the company's welfare program so as to secure the interest and co-operation of employees.

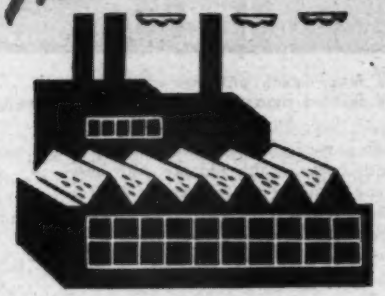
32. Records of off-the-job accidents to disclose the size and nature of the problem and to guide corrective action. Interest in safety, stimulated by off-the-job activities, will prove a valuable asset to the industrial program; hence a definite proportion of time and effort should be devoted to these activities.

what the PAYROLL SAVINGS PLAN *means*

To you

To your Industry

and your Employees



Facts and figures prove **the Payroll Savings Plan to be a tremendous national asset. Through this plan, no less than 27,000,000 workers have so far saved more than $13½ billions to help speed victory . . . forestall inflation . . . and build peacetime prosperity!**

Did you know that yours is one of 240,000 companies maintaining a Payroll Savings Plan? Not only is this combined effort fostering national security, but also creating a lucrative postwar market for you . . . and all American industry!

Have you realized that 76% of all employed in industry are now enrolled in the Payroll Savings Plan . . . averaging a $25 bond each month per employee? Through this plan, millions are now looking forward to homes, educational opportunities and old age independence!

Surely, so great an asset to your country, your company and your employees is worthy of your continued . . . and increased . . . support! Now is the time to take stock of your Payroll Savings Plan. Use selective resolicitation to keep it at its 7th War Loan high! Keep using selective resolicitation to build it even higher!

The Treasury Department acknowledges with appreciation the publication of this message by

THE PAPER INDUSTRY AND PAPER WORLD

This is an official U. S. Treasury advertisement prepared under the auspices of the Treasury Department and War Advertising Council

LEFT—Clean washrooms and uncluttered lockers mean fewer health problems and fire hazards. . . . RIGHT—Good medical facilities and well-equipped first-aid rooms guard health of employee.

The individual company or plant can be greatly aided in its accident prevention work by many joint or co-operating agencies including:

Government departments, federal, state and local, concerned with industrial safety and hygiene, fire or health

Insurance companies, agencies and associations

Machine manufacturers, supplies of safety and other industrial equipment

Civic, professional and commercial associations, national, state and local, dealing with safety, health and fire, with business and industry in general, or with a particular industry

Labor organizations

Educational institutions — universities, colleges and schools, both technical and general

Fields of Activity

The following are among the more important kinds of assistance which these agencies are in a position to offer:

1. Study and research or accident causes and remedies; in particular, study of the hazards involved in new technological processes, and of the methods of protection against such hazards, *before* the use of these processes becomes general.

2. Study of the best methods of selection, placement, and training of workers, and of organizing and conducting plant safety programs.

3. Development and distribution of information on job analysis, emphasizing the safety factors of each job and the physical and mental requirements necessary to do the work safely, for use in job placement.

4. Collection, analysis and publication of accident statistics, including comparative accident rates for different types of industries, outstanding accident records, and off-the-job accident data.

5. Standardization of accident report and record forms, including standardized procedures for accident analyses and for determining the cost of accidents and the savings effected by safety programs.

6. Standardization of safety equipment and operating methods, with sufficient elasticity to permit new developments; development of new standards and modernization of standards as needed.

7. Building safety into the design of plants and equipment; developing and providing special safety equipment.

8. Testing and approving of safety equipment.

9. Training courses and instructional inspirational meetings for safety engineers, safety inspectors, foremen and workers.

10. Specialized safety and industrial hygiene training courses in schools and colleges.

11. Inspection of plants for specific hazards; assistance in organizing plants for safety.

12. Consultation service on particular problems, by personal visits or by correspondence.

13. Interchange of information on hazards and remedies; widespread dissemination, to management and others, of authentic information on effective safety programs.

14. Economical mass production of safety posters, magazines, pamphlets and other literature, motion pictures, film strips and similar materials needed for training programs and for maintaining interest in safety.

15. Appropriate publicity for newsworthy phases of safety and health in national magazines, newspapers, trade and professional journals, and on the radio.

16. Inter-plant safety contests within an industry and between industries.

17. Preparation and distribution, by trade associations and other national organizations of suitable safety programs and materials for their local units or affiliates.

18. Co-operative local safety engineering and medical facilities for smaller plants. Development of suitable safety materials, services and accident statistics to make the small plant operator aware of the need for, and the advantage of, a definite safety program.

The effective conduct of all these activities requires adequate, competent, well-trained personnel, and definite, adequate budgets for the agencies conducting them.

Some of these activities are particularly appropriate for certain agencies. Others can be effectively carried on by several agencies, provided conflict or harmful duplication is avoided. Complete co-ordination and co-operation of all agencies is urgently needed if industrial accidents are to be reduced to a minimum.

Why one husband kissed his wife four times!

"Here's a kiss for the money you're saving . . . while it's coming in faster through the war years. I know in my bones jobs like mine may not last forever. Who can tell what's going to happen day-after-tomorrow? Thank God you've got sense enough to see that today's the time to get a little money tucked away.

"Here's a kiss for the War Bonds you're making me hold on to! I'd never do it without you, honey; it's too easy to find reasons for cashing 'em in—but when it comes time to put the children through school or pay for an emergency operation, we'll be thankful.

"Here's a kiss for the insurance you talked me into buying. I've felt a lot easier ever since I've known our future is protected—you and the kids would be safe if anything happened to me—you and I won't have to spend our old age living on someone's charity. And every cent we put in insurance or War Bonds or other savings helps keep prices down.

and

here's a kiss for being *you*—a woman with brains enough in your pretty head to make sure we don't buy a single thing we *don't* need in times like these—because you know a crazy wave of spending in wartime would march America straight into inflation. Baby, I sure knew how to pick 'em the day I married you!

ONE PERSON CAN START IT!

You give inflation a boost

—when you buy anything you can do without

—when you buy above ceiling or without giving up stamps (Black Market!)

—when you ask more money for your services or the goods you sell.

SAVE YOUR MONEY. Buy and hold all the War Bonds you can afford—to pay for the war and protect your own future. Keep up your insurance.

HELP US KEEP PRICES DOWN

A United States War message prepared by the War Advertising Council; approved by the Office of War Information; and contributed by this magazine in cooperation with the Magazine Publishers of America

Convention Papers . . . Abridged

The first two abridgments in this section are from papers presented "by title" at the annual meeting of the Technical Association of the Pulp and Paper Industry, held in New York City, February 19, 1945.

Preparation and Applications Of Pulp-Resin Preforms

R. H. MOSHER[1], N. N. T. Samaras[2], and L. M. DEBING[2]

The art of pulp molding is quite old (Chaplin, M. P., PAPER IND. AND PAPER WORLD, 21, No. 5: 567, 71-2, August, 1939). The earliest known patents were issued around 1865 and covered the preparation of such articles as pulp hats and coffins. The production of papier-maché articles and the well-known pie plates and milk bottle caps has been continued on through the years, with numerous process and equipment patents being granted. In the last few years, interest has increased in the commercial production of articles containing synthetic resins in combination with the pulp articles. In general, the plastic pieces are produced using thermosetting resins but there is no inherent reason for not employing thermoplastics if they are able to impart certain desired qualities to the finished piece.

General Information on Pulp Preforms

The question is often asked, "Why use pulp preforms when regular plastic moldings can be made so easily?" If one can visualize the eventual use of pulp preforms in the production of large units, such as radio cabinets and refrigerator doors, as well as in the small pieces requiring high strength properties such as are now being commercially produced, the answer becomes readily obvious.

When a wood flour or cotton flock filled molding powder is molded in a large cabinet die containing a deep draw and sharp-angled corners, excellent flow of the plastic material or high molding pressures are required. The resulting cabinet has an excellent and smooth surface finish but the physical strength characteristics for this application are only fair. This cabinet would easily shatter if dropped or given a sharp blow. By molding this same cabinet with a rag or cord-filled molding compound, however, a piece could be produced which would have the desired high physical strength properties. On the other hand, it would have a relatively poor surface and because of the limited flow characteristics of these materials would require very much higher molding pressures. This example illustrates basic limitations of molding compounds or powders for the production of large pieces.

When using a pulp preform to make this same piece, however, the pulp mold is made to conform very closely to the dimensions of the final molded piece. It goes into the press with the correct amount of fiber and resin distributed uniformly throughout the die. Consequently, when the press is closed, no flow of the fibrous filler is required and only compression and resin flow take place. The final molded product is, therefore, composed of a uniform material containing a continuous felted and interlocked fibrous reinforcing structure, bonded together by the synthetic resin. This produces a dense, hard and smooth surfaced piece which is resistant to shock, wear, and chemical action.

The preforms may be molded as prepared or stacked in storage until needed, as there is no apparent deterioration over a reasonable period of time. If the design permits, the preforms can be molded in conventional metal dies if desired, but in many cases the use of an expanding rubber bag mold is necessary or advantageous. (Pfeilsticker, C. S., *Plastics World*, July, 1944). In some respects this would be the most effective method of pressure application, in that axial pressure would be exerted equally and simultaneously on all parts of the preform. It must be remembered, however, that the use of the bag would leave one side of the molding with a rough surface. While this would no doubt be a detriment to such an object as a mess tray, it should be no drawback for a piece like a radio cabinet or a business machine housing.

The mold costs are not excessively high because Kirksite, Mechanite, or some of the other easily cast and machined metals can be used (Sachs, C. C., *Iron Age* 153, 71-5, April, 1944). By using a mold which utilizes a rubber bag to apply the desired pressure, the size of the molded piece is not limited by the capacity of available presses as is often true at the present time with molded articles. While it has been claimed possible to use cast resin, plaster of Paris, or hard wood dies, we have found that, for the best results, both the male and female units of the die should be heated so that resin flow and cure are equalized and a uniformly molded and cured piece is obtained.

The natural color of phenolic resins is a shade of brown or tan, but by dyeing or pigmenting the pulp, a range of colors can be prepared. By using melamine resins and white pulps, light and pastel shades can be produced, and for some pieces this would be a distinct advantage. It is also possible to surface relatively flat preforms with a thin wood veneer, cloth sheets, or printed paper, so that after molding has taken place, the surface layer is an integral part of the piece. If desired,

(1) Plastics Div. (2) Research Dept., Plastics Div., Monsanto Chemical Co.

Table I—The effect of fiber type on the physical strength properties of fiber-resin preformed materials

Preformed Fiber Type	Resin Type and Content	Molding Pressure, P.s.i.	Specific Gravity	Flexural Strength (P.s.i) Parallel (#) Flexural, P.s.i.	Parallel (#) Deflection, Inches	Perpendicular Flexural, P.s.i.	Perpendicular Deflection, Inches	Edgewise Compressive Strength, P.s.i.	Impact Strength (Notched Izod) Ft. lb./inch of notch Perpendicular	Parallel (x)	Tensile Strength, P.s.i	Water Absorption, %
Kraft	Phenolic 45%	2000	1.33	17,140 ± 1008	0.081	17,120 ± 676	0.077	27,400 ± 333	3.11 ±0.10	0.85 ±0.05	11,400 ± 740	0.58
Alpha	Phenolic 45%	2000	1.35	17,100 ± 700	0.071	19,300 ± 775	0.088	25,540 ± 804	1.91 ±0.09	0.85 ±0.03	11,260 ± 1243	0.43
Defibered rag	Phenolic 45%	2000	1.35	17,000 ± 775	0.097	16,200 ± 533	0.093	26,400 ± 1200	2.67 ±0.15	1.54 ±0.04	10,000 ± 320	0.66
Sulphite	Phenolic 45%	2000	1.35	13,930 ± 252	0.067	13,260 ± 328	0.060	26,500 ± 1300	2.69 ±0.12	0.78 ±0.04	9,500 ± 480	0.69
Groundwood	Phenolic 45%	2000	1.34	11,800 ± 220	0.055	10,820 ± 234	0.059	22,400 ± 1243	1.21 ±0.07	0.55 ±0.04	8,400 ± 809	0.43
Waste paper	Phenolic 45%	2000	1.35	11,600 ± 1733	0.044	12,320 ± 864	0.046	28,000 ± 943	1.54 ±0.09	0.61 ±0.21	8,100 ± 807	0.55
Asbestos glass-fiber 85-15	Phenolic 45%	2000	1.72	17,700 ± 525	0.050	17,970 ± 1155	0.050	27,000 ± 640	2.94 ±0.19	2.10 ±0.05	9,300 ± 1400	0.14
Lignin enriched filler	None	6600	1.43	11,420 ± 172	0.044	11,300 ± 592	0.042	16,840 ± 348	1.45 ±0.16	0.70 ±0.07	7,200 ± 279	4.09
Lignin enriched filler	Phenolic 20%	4400	1.42	8,200 ± 325	0.030	8,470 ± 490	0.034	20,530 ± 1001	1.39 ±0.12	0.57 ±0.05	7,200 ± 1160	0.78

(#) Broken parallel to molding pressure. (x) Notch runs parallel to molding pressure.

the molded preforms can be surfaced or sprayed like any other plastic material.

Preparation on the Preforms

There are two general methods of preparing pulp-resin preforms: the first by dispersing the resin throughout the pulp in the beater or stock tank and then felting out pulp and resin together in the preforming unit; and the second, by preforming the pulp and then adding the resin by an impregnation operation.

Beater Dispersion Methods

The pulp is broken up in the beater with just enough processing to thoroughly break up all fiber bunches and uniformly disperse the individual fibers. The resin can be then added to the pulp, either directly in the beater or if desired, in a stock or mixing tank into which the beater has been emptied. The resin can be added in the form of finely ground particles or as a solution or emulsion from which the resin can be precipitated. The fiber and resin mixture should be thoroughly agitated in order to obtain a uniform dispersion of the resin through the pulp slurry. The fiber resin dispersion can then be pumped to a stock tank and held for a reasonable period of time before use, if necessary, but good agitation must be maintained in order to keep well dispersed mixture.

The fiber-resin dispersion is then metered to the felting tank and here there is a choice of two preforming methods.

Vacuum Felting—The preforming may take place in an open tank, wherein the consistency is accurately controlled by a suitable device. The forming die, composed of a perforated metal backing covered with a fine wire screen, is lowered beneath the water surface, vacuum applied, and the water pulled through while the fibers and resin collect on the felting screen. There is generally a small part of the resin in the form of minute solid particles and some soluble portions which are pulled through the screen and appear in the "white water." By using a closed system in which the waste water from the felting tanks is redistributed as make-up water in the beater or dilution water in the felting and stock tanks, this loss can be reduced to a negligible value. Experimental runs have shown that there is an equilibrium set up in the "white water" for both solids and solubles, and when this has been attained, additional losses are negligible.

The screen is then raised above the surface of the water, the vacuum cut off, and air pressure utilized to release the preform. If it is relatively small, the preform will be self-supporting, but if it is large in area or heavy, some sort of a transfer die or supporting member must be used.

The preform still contains a large amount of free water and has a high bulk factor, so the general procedure is to transfer the preform to another die wherein pressure can be applied to reduce the bulk and remove most of the free water. Numerous patents have been taken out covering equipment to automatically felt and

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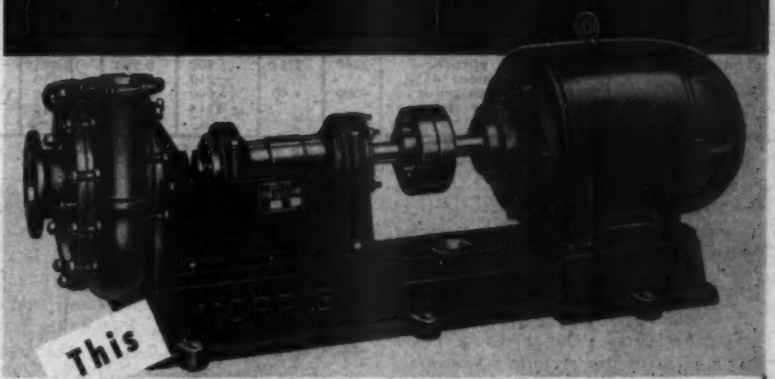
With a Viscosity of 7420 SSU at 150° F



MORRIS TYPE "S"
CENTRIFUGAL SLURRY PUMP...

gave longer service with fewer replacements than positive displacement pumps

● Viscosities of this range are normally considered "impossible" for centrifugal pumps. But the recovery plant of a large Virginia paper mill discovered that a MORRIS type "S" slurry pump would deliver 500 gallons per minute of this viscous black liquor, against a 75-foot total dynamic head. Not only deliver this volume, but keep it up year after year, with an astonishingly low rate of wear and need for replacement parts. In short, MORRIS pumps were finally selected over positive-displacement pumps because their over-all cost was lower.

Engineered for the JOB...

★

Morris engineers have been building outstanding centrifugal pumps for 81 years. Let them consult with you on your pumping problems. No charge. No obligation.

The secret of this outstanding performance is that this MORRIS pump—like all MORRIS pumps—was engineered for the job. Extra wide shell and impeller clearances reduced internal friction. Extra heavy wearing parts resisted abrasion and corrosion. The operating speed was low. The suction opening was large. Result: the viscous black liquor was handled by the pump with a minimum of friction, scouring and chemical action.

MORRIS MACHINE WORKS
Baldwinsville, N. Y.
Branch Offices in Principal Cities

MORRIS CENTRIFUGAL PUMPS

Table 2—The effect of resin type on the physical strength properties of fiber-resin preformed materials

Preformed Fiber Type	Resin Type and Content	Molding Pressure, P.s.i.	Specific Gravity	Flexural Strength (P.s.i) Parallel (#) Flexural, P.s.i.	Parallel (#) Deflection, Inches	Perpendicular Flexural, P.s.i.	Perpendicular Deflection, Inches	Edgewise Compressive Strength, P.s.i.	Impact Strength (Notched Izod) Ft. lb./inch of notch Perpendicular	Parallel (x)	Tensile Strength, P.s.i	Water Absorption, %
Kraft	Beater dispersed phenolic 45%	2000	1.36	28,000 ± 450	0.201	29,940 ± 1233	0.180	22,600 ± 80	5.07 ±0.41	0.91 ±0.13	19,200 ± 1034	2.21
Kraft	Impregnated phenolic (alcohol solution) 45%	2000	1.33	17,140 ± 1008	0.081	17,120 ± 676	0.077	27,400 ± 333	3.11 ±0.10	0.85 ±0.05	11,400 ± 740	0.58
Kraft	Impregnated phenolic (water solution) 45%	2000	1.34	15,900 ± 250	0.060	13,075 ± 750	0.066	23,700 ± 460	1.92 ±0.09	0.77 ±0.13	10,920 ± 1144	0.41
Sulphite	Impregnated melamine (alcohol-water solution) 45%	4000	1.40	13,000 ± 1114	0.054	13,700 ± 650	0.049	19,100 ±2500	2.17 ±0.78	0.64 ±0.04	7,500 ± 564	0.60

(#) Broken parallel to molding pressure. (x) Notch runs parallel to molding pressure.

presqueeze preforms in a continuous process and a number of the units are now in commercial operation. (Chaplin, M. P., Pulp molding machine, U. S. pat. 1,730,450), Keyes, M. L., Machine for making pulp articles, U. S. pat. 740,023).

Pressure Felting—The alternative process for preparing the preform is known as pressure felting (Hawley, J. B., Method and apparatus for forming fibrous pulp receptacles, U. S. pat. 1,673,047) (Hatton, W. H., Apparatus for molding pulp bodies, U. S. pat. 2,105,593). In this type of operation, the metered amount of stock is injected into a closed unit, the bottom of which is the forming screen and the top a movable piston fitted with a screen. When the charge of stock is all in the unit, the vacuum is applied to top and bottom screens simultaneously while the piston descends, thus forming the preform between the two screens. This type of felting unit, although more or less limited to one specific piece or type of piece, has a high rate of production and the preforms produced have very accurate dimensions and are of uniform density. Since the preform has been presqueezed during the last portions of the felting operation, there is no need for a separate densification and water removal step.

The felted preforms are then oven dried to remove the remaining water and bring the preform to the desired volatile content for molding. Care must be exercised during the drying operation, that the temperature is not run too high in the case of thermosetting resins in the preform, since they are susceptible to advancement and loss of flow properties.

Impregnation Methods

The preparation of the preform is the same as previously outlined except that no resin is added to the pulp slurry. Either vacuum or pressure felting methods can be used, but care must be exercised during the presqueezing operation and the final portion of the pressure felting operation so as not to densify the preform too much, or the impregnation with the desired resin will be difficult.

The oven dried preform is then impregnated with a solution of the resin. By carefully adjusting the impregnation conditions, such as temperature, viscosity, and total solids content of the resin solution and the time of submersion, the desired resin pickup can be closely controlled within narrow limits.

The impregnated preform is then placed in an oven and the solvent removed while the resin is advanced to the moldable state. The solvent may be recovered if desired but is generally merely exhausted to the atmosphere.

Both methods of preform preparation are in current use on a production basis in this country.

The Resins Utilized in the Pulp Preforming Process

The resins used in the process can be divided into two main groups according to the method of incorporation into the fiber preform. The first type includes those which are added by the beater dispersion technique, and the second the types added by the impregnation methods.

Beater Dispersion Methods

The main characteristic of the beater dispersion resins is that they must be practically water insoluble in the fiber-resin dispersion. Whether put into the beater

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as an insoluble and finely divided solid, or as an emulsion or solution from which the resin can be precipitated in the final fiber-resin dispersion, the resin must be in a form that can be filtered out with the pulp on the preforming screen.

Into this general category fall finely divided phenolic resins which are mechanically retained by the fibers during the felting operation, and phenolic resin solutions and emulsions which can be precipitated after disperaion and in part attached chemically or colloidally to the fiber and in part retained mechanically during the felting. Also listed here are the various water insoluble thermoplastics, such as the aniline resins (Gams, A., and Frey, K., Infusible resins and process of making same, U. S. pat. 2,031,260), (Kienle, R. H., and Scheiber, W. I., Resinous material and method of making the same, U. S. pat. 1,812,749), coumarone and indene resins (Kenney, J. A., Laminated sheet and process of making the same, U. S. pat. 2,104,081), lignin resins, polystyrene and other vinyl resins (Groft, F., Impregnated product and process for making the same, U. S. pat. 1,919,697), etc.

Impregnation Resins

There are three general methods and resin types used for the preparation of resin-fiber preforms by impregnation methods. In the first two cases, the solvent carries the resin throughout the preform in order to form a thin film over each fiber, and in the third case, very low viscosity polymerizable liquids (monomeric solutions) containing no solvent are used to thoroughly impregnate the preform.

Solutions and emulsions of condensation type resin—The most important characteristics of the resin include solubility or dispersibility in one or more of the cheap and common solvents, ease of solvent removal, advancement at relatively low temperatures, and cure to a stable and hard structure at medium high temperatures. The resin types include phenolic, urea, and melamine resin, each of which can be used to produce some desired property in the cured piece. Moldings prepared with these resins can be removed from the mold at the end of the curing period without cooling the mold.

Solutions and emulsions of thermoplastic resins—Except for aniline types, only emulsions of these resins can be used, because of the high viscosity of the solutions. There is not much demand for these materials, because of the poor stability against heat distortion, high cost of the resins, and the necessity to cool the mold before the cured piece can be ejected.

Polymerization type resins—The main requirements of this type of resin for application in the pulp preforming process is that the monomeric solution be of sufficiently low viscosity so that thorough impregnation of the preform can take place. The resins do have the advantage of not giving off any vapors during the curing operation and requiring only the minimum of molding pressures, thus reducing mold and press requirements.

In general, it is believed that the materials which can be most effectively utilized in the pulp preforming process are the phenolic and melamine resins. The pieces produced using phenolic resins possess high physical strength properties, are stable over a wide range of temperatures (—60 C. to plus 150 C.), can be pulled while still hot from the mold and are highly resistant to chemical action. The cured pieces are dark in color but for most structural and large unit applications, this is not important. The melamine resins also possess good physical strength properties and can be produced in light and pastel colors.

The Physical Strength Properties of Preformed Molded Resins—Fiber Combinations

The physical strength properties of the molded pulp-resin preforms are dependent upon two main factors, the first being the type of fiber employed as a filler, and the second being the type of resin used and the method of incorporating it into the preform. The properties are also dependent of course on other variables, such as molding conditions, preform drying conditions, etc., but these can be controlled to obtain the desired results.

The effect of the type of fiber on the physical strength properties can be found in Table 1.

The effect of the resin type and method of application can be seen in Table 2.

Commercial Applications for Pulp Preforms

Generally speaking, pulp preforms are used for one of two reasons. First, they

may offer an advantage over the materials now being used; secondly, they may make possible the molding of pieces which cannot be satisfactorily produced by standard materials and techniques.

Pulp preforms can be used in the field of smaller moldings, whenever a large number of pieces can be turned out using the same preforming and molding dies, and wherever there is a definite demand for exceptional physical strength, good chemical resistance and surface properties. Such applications are now being exploited by several large companies (Haslanger, R. U., and Mosher, R. H., *Mod. Plastics* 20, No. 11: 76-77, July, 1943) (Martin, H. C., *Plastics* (G. B.) 8, No. 90, November, 1944) (Parsons, W. E., *Mod. Plastics* 20, No. 12: 61, 138, August, 1943) (Parsons, W. E., *Brit. Plastics* 16, No. 182: 314-6, July, 1944) (Young, S. H. A., and Box, R. J., *Mod. Plastics* 21, No. 4: 116, December, 1943) (Taylor, N. J., *Plastics* 1, No. 7, December, 1944). The scope of these products ranges from plates and serving trays, alarm clock cases, equipment bases, and telephone stands, through to the medium size articles such as business machine housings. In this field, however, it must be remembered especially with the smaller pieces, that the principal competition is with the regular molding compounds.

The other, and mainly unexplored field, is that of large moldings, where good physical strength properties are a necessity and good appearance is an advantage. This field includes the medium and large pieces which cannot be profitably molded by any other process. Here such objects as table and desk tops, refrigerator doors, automotive and decorative panels, radio cabinets, furniture, and many other are visualized. In this field, the only present methods which could possibly be used are post-forming or low-pressure laminating, and each of these techniques possesses definite inherent advantages and disadvantages.

It is confidently predicted that these pulp-resin combinations will be widely accepted, employing newer techniques and improved resins. Pulp molders and resin suppliers have been mainly responsible for the development to date. However, in order to fully realize the potentialities of these processes, the interest and co-operation of the pulp and paper industry must be enlisted.

Acknowledgment — The authors are grateful to the Monsanto Chemical Company for permission to publish the experimental data included in this paper. We also wish to acknowledge the assistance of Mr. J. B. Griffin in carrying out much of the laboratory work involved.

RESULTS

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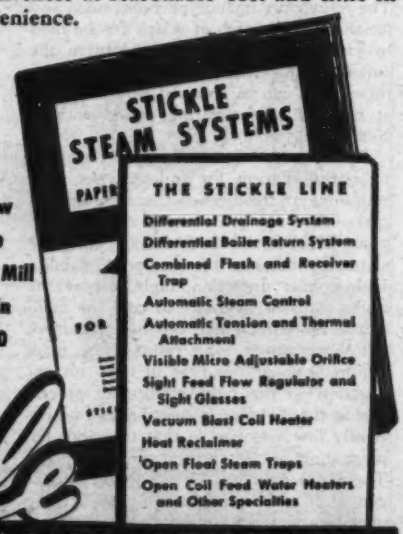
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Identification to Melamine And Urea Resins In Wet Strength Paper

R. W. STAFFORD, W. M. THOMAS, E. F. WILLIAMS, N. T. WOODBERRY
Stamford Research Laboratories

Methods designed for the detection and recognition of nitrogenous wet-strength additives may be divided into two arbitrary classes:

A. *General methods*, including preliminary examination, elementary analysis by fusion with metallic sodium, loss of wet strength on acid hydrolysis, etc.

B. *Specific methods*, including the various color procedures for the constituent *in situ* and/or after removal from the test sheet, and also those techniques based on the preparation of a characteristic derivative of the constituent after its removal from the sheet.

The various methods of Class B may be further subdivided with respect to ease and speed of application. In the discussion which follows, they have been arranged in order of increasing time required for the performance of the test.

GENERAL METHODS

Such procedures are rapid methods yielding results which require not only experience for evaluation, but also correlation with other data. The more common are discussed briefly as follows:

Preliminary Examination

Observation of the nature or grade of the unknown sample by the experienced paper man often results in saving of time; e. g., if the sheet is coated in any way, it would obviously be desirable to remove this coating before testing for various resins in the base sheet. It is also conceivable that urea or melamine resins might

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be present both in the base sheet and in the coating composition. This might present difficulties, although it would often be possible to get around this complication by sectioning the sheet or removing the coating chemically, and then comparing the results of some of the qualitative tests applied separately to the coated surface and to the interior of the sheet. In the case of waxed or impregnated papers, it may be desirable to attempt to extract the wax or impregnant with a suitable solvent, prior to the application of the resin tests. A small portable source of ultraviolet light is often of value in detecting such coatings and impregnants.

The grade of paper being examined is also of importance, e. g., if it is a toweling grade having only slight to moderate wet strength, the presence of a high proportion of "wet strength" resin would not be expected, and the sensitivity of the proposed test procedures would have to be taken into account. Again, parchment paper is characterized by having both wet strength and grease resistance, while greaseproof and glassine papers ordinarily show grease resistance, but do not have wet strength. Although the difference between those grades may be apparent to the trained observer, the inclusion of wet strength resins in greaseproof and glassine papers may necessitate the use of some of the subsequent tests to classify such samples properly.

In all instances, the degree of wet strength should be noted, as in the majority of cases it will be proportional to the amount of resin present. Of course, this is not always true, particularly when different types of resins are involved.

Burning a portion of the sample is still another preliminary procedure which may prove helpful, by resulting in the evolution of characteristic odors too strong to be masked by the burnt toast odor of the charring paper. The unforgettable odor of burnt hair, suggesting the presence of the proteins, is one example; the penetrating odor of formaldehyde is another significant indication.

Elementary Analysis

Analysis by fusion with metallic sodium is a valuable qualitative procedure which permits the detection of sulphur, nitrogen, halogens, and phosphorus. This rapid method, which is discussed in considerable detail in standard organic analysis texts such as Kamm (*Qualitative Organic Analysis*, 2nd ed., New York, John Wiley and Sons, 1932) and Shriner and Fuson (*The Systematic Identification of Organic Compounds*, 2nd ed., New York, John Wiley and Sons, 1940), effects the conversion of the listed elements to water-soluble compounds, which are then tested for in solution by the use of appropriate reagents. In the case of paper samples, the fusion is carried out by rolling a piece of metallic sodium (the size of a small pea) in a strip of the paper to be tested, and then heating the sample strongly in a soft-glass 3-inch test tube. The melt is decomposed by quenching the tube and its contents in 5 to 10 ml. of water, and the usual tests are applied to the filtered solution.

An alternative, semimicro method for nitrogen alone consists of decomposing a few strips of sample paper with a small volume of concentrated sulphuric acid and a crystal of copper sulphate in a small Erlenmeyer flask, cooling and cautiously making alkaline with strong caustic, and then finally distilling any liberated ammonia into a hanging drop of dilute hydrochloric acid on a microscope slide. (In effect, a small-scale qualitative Kjeldahl.) The ammonia is then detected optically by the characteristic crystals it yields upon the addition of chlorplatinic acid to the test drop (Chamot, E. M., and Mason, C. W., *Handbook of Chemical Microscopy*, Vol. II, 2nd ed., New York, John Wiley and Sons, 1940).

Subsequent to the identification of the nitrogenous constituent present, it is possible to estimate its proportion from the total nitrogen as determined by quantitative analysis. Multiplication of the per cent nitrogen found by the factors 2.6, 4.3, and 6.38 yields the per cent trimethylol melamine, dimethylol urea, and protein, respectively. Although it is true that different grades of melamine and urea resins contain varying proportions of nitrogen, it is believed that the use of the above factors will be sufficiently accurate for most purposes.

Hydrolysis

Hydrolysis treatments applied to the unknown sheet frequently enable classification of the wet strength agent into one of several groups. Such a procedure is particularly valuable if it is already known that the paper has been treated with either a melamine or urea resin, e. g., samples of the "unknown" sheet can be cut into

pieces of convenient size, and similar samples prepared of known sheets containing melamine and urea resins, respectively. The wet strength of each sheet is measured before treatment, and then comparable pieces of each sample treated by soaking for an hour at 130 Fahr. in a solution of about 0.1 per cent alum (commercial aluminum sulphate). The wet strength of the treated unknown is then compared with the wet strengths of the two known samples. Under these conditions a melamine resin-treated paper should show less drop in wet strength after the hydrolysis treatment than a urea resin-treated paper.

A similar test can be run under slightly different conditions, as follows. Sheets of each paper sample are cut into pieces about 4 or 5 inches square and added to a bath of 2 liters of 0.25 per cent boiling alum solution. Sheets of each sample are withdrawn at intervals, washed and immersed in cold water for about an hour. Wet burst measurements are then made and the results plotted. Figure 1 shows the results of such a comparison as made on two sheets, one containing a melamine resin and the other a urea resin. The difference between the two is quite evident.

Obviously, modifications and refinements of the hydrolysis procedure may be required to secure the desired information in some cases, and it is quite possible that interfering factors may prevent universal application of such a test.

What appears to be a logical approach to the differentiation of melamine and urea resins in paper, by a hydrolysis procedure, has been made by Britt as reported in a recent article (PAPER IND. AND PAPER WORLD 26, No. 1, 37-46, April, 1944). By this procedure paper samples are treated in hot buffer solutions of various pH values at 200 Fahr. for 30 minutes, and the comparative losses in wet tensile strength observed.

SPECIFIC METHODS

Jorissen Formaldehyde Test—

Mattiello, J. J. (Ed.), Protective and Decorative Coatings, Vol. V. New York, John Wiley and Sons (in publication).

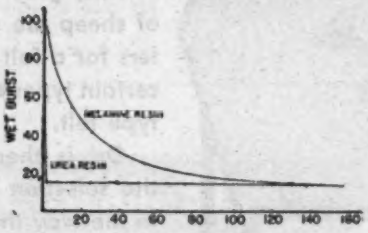

Fig. 1—Relative wet strength loss on acid hydrolysis (pH 3 to 4)

Boil a few small squares of the sample in question with approximately 5 ml. of water containing 5 drops of 1:4 HCl. Cool, add a pinch of phlorglucinol, and make alkaline with caustic. A red coloration indicates the presence of formaldehyde. Acetaldehyde gives an orange-yellow coloration which deepens on standing. Under the above conditions, the reagent alone gives a lavender coloration. The test is quite sensitive; formaldehyde has been detected without difficulty in a 0.25-inch square of test paper containing 2 per cent melamine resin.

This test has proved extremely valuable as a means of preliminary classification of possible wet strength treatments.

Biuret Protein Test— (See reference following Jorissen Test, above).

Add 2 ml. of water to 5 to 10 mg. of the unknown material isolated by extraction of the sheet with 1% NaOH solution) in a 3-inch test tube, followed by 1 to 2 drops of dilute copper sulphate solution. Then add 2 to 3 drops of 50% potassium hydroxide solution, and shake. A delicate violet coloration that deepens on standing is indicative of a protein or protein degradents. The precipitation of copper hydroxide may be prevented by the addition of a few crystals of sugar. Polyhydric alcohols interfere by causing a deep blue coloration. The test is given by both casein and glue.

Millon's Protein Test — According to TAPPI procedure T 415 M-41, approximately 0.5 gram of test paper is cut into small pieces and boiled several minutes with 10 ml. of 1% caustic soda solution (which dissolves hardened casein). The filtered and cooled extract is neutralized with nitric acid to a phenolphthalein end point, and the neutralized solution is heated with several milliliters of Millon's reagent.

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The development of a coagulated red mass indicated casein. Since the reaction depends on the presence of tyrosine, it is generally limited to "whole" proteins such as casein and soya, and is not generally given by degraded proteins such as animal glue and gelatin.

Numerous directions for the preparation and use of Millon's reagent have been described in the literature (Sutermeister, Edwin, *Chemistry of Pulp and Paper Making*, 3rd ed., New York, John Wiley and Sons, 1941) (Bodansky, Meyer, and Fay, Marion, *Laboratory Manual of Physiological Chemistry*, 4th ed., New York, John Wiley and Sons, 1938). In the author's laboratory, the following procedure has been found convenient. Millon's reagent is prepared by dissolving 1 part by weight of mercury in 2 parts by weight of nitric acid (sp. gr. 1.42), warming gently until solution is complete, and then diluting with 2 volumes of distilled water. After standing several hours, the supernatant solution is decanted from the crystalline precipitate.

Using *dilute* Millon's reagent (1 drop of reagent prepared as above to 10 drops of water), we have obtained good results in detecting casein without prior removal from the sheet. A small square of paper is immersed in the dilute solution and heated for 5 minutes in a beaker of hot water. Casein gives a positive test (pink to red coloration of the paper) under these conditions; glue, urea-formaldehyde, and melamine-formaldehyde yield negative tests, as does casein hardened with formaldehyde. The test does not appear to be sensitive to proportions of casein much less than 2%.

Schmidt's Glue Test—Glue or casein which has been extracted with dilute alkali can be generally differentiated by acidification of the alkaline extract solution with dilute hydrochloric acid. The casein is precipitated, while the glue remains in "solution." In the absence of casein precipitate, the presence of substantial amounts of soluble glue may be confirmed by the application of Schmidt's reagent (Sutermeister, Edwin, *Chemistry of Pulp and Paper Making*, 3rd ed., New York, John Wiley and Sons, 1941). One volume of the reagent is added to 2 volumes of HCl neutralized paper extract; a white precipitate indicates the presence of glue or other nitrogenous matter. Schmidt's reagent is prepared by dissolving 3 grams of ammonium molybdate in 250 ml. of distilled water, and then adding 25 ml. of dilute (2:3) nitric acid. Since the reagent is not very stable, it should be made up as needed.

An interesting set of color reactions, discussed by Rendle and Franklin (*J. Soc. Chem. Ind.* 62, 11, 1943) may be used to supplement the protein tests described above. Designed for the identification of plywood glues, the tests include determinative staining reactions, *in situ*, on animal or hide glues, blood albumin, casein and soybean protein. Steinitzer (*Kunststoffe*, 5, 73, 1915) also lists a variety of tests applicable to protein materials.

Dye Staining Technique for Melamine Resins—This test is based upon the fact that acid dyestuffs are not substantive to cellulose, and unless mordanted, can easily be washed from cellulose fibers. On the other hand, the acid dyes combine with "protein-like" substances such as wool, glue, casein, and amino aldehyde resins. One of these acid dyes, Calcocid Alizarine Blue S.A.P.G. (supplied by Calco Chemical Division, American Cyanamid Company) has been chosen as being particularly useful for the present purpose. By use of this dye under specified conditions, untreated paper can be quickly distinguished from paper containing materials such as proteins, urea resins, or melamine resins. By using three different modifications of the same technique, applied to separate portions of the unknown sample, it is generally possible to decide positively whether or not melamine is present or to obtain indications as to the nature of the other nitrogen-containing substances if melamine is not present.

The detailed procedures for performing the tests are as follows:

1. *Stock Solutions*

Solution A—A 1% solution of NaOH (0.25N).

Solution B—A 0.1% solution of Calcocid Alizarine Blue S.A.P.G., containing 0.1% H_2SO_4.

Solution C—A 0.1% solution of Calcocid Alizarine Blue S.A.P.G., containing 1.0% H_2SO_4.

2. *Preparation of Paper Samples*

Samples of uniform size are cut from each sample being tested and the pieces marked. A square 1.5 inches on a side is convenient, and is large enough for spectrophotometric reflectance measurements if such are to be made. In order to make certain that the dye held on any paper sample is due at least to a "protein-like" substance, a piece of known untreated paper is always included with the other test samples. The "known" or control sample should, if possible, be of a type similar to that of the sample being tested, except that wet strength additives should not be present. More important, the control should be similar in color to the sample being tested.

3. *Dyeing Procedures*

Procedure I—Use 200 ml. of Solution "B" (0.1% Calcocid Alizarine Blue, S.A.P.G., 0.1% H_2SO_4) for every gram of paper. Dye the sheets (including control sample) for 5 minutes at room temperature in the bath, which should be stirred frequently to prevent the samples from sticking to each other. The sheets are then washed in three 500 ml. portions of cold water or until the control sheet is free of any surface adsorbed dye.

A blue coloration obtained by use of Procedure I indicates the presence of some sort of "protein-like" substance.

Procedure II—Use 200 ml. of Solution "C" (0.1% Calcocid Alizarine Blue, S.A.P.G., 1.0% H_2SO_4) for every gram of paper. Dye the sheets (including control sample) for 5 minutes at the *boil*. The sheets are then washed in three 500 ml. portions of cold water or until the control sheet is free of any surface adsorbed dye.

With the increase in temperature and amount of acid as in Procedure II, the two competing reactions which exist in the dyebath have been accelerated. The hot acid rapidly hydrolyzes urea formaldehyde resin, and proteins in some instances. On the other hand, the higher temperature and acid concentration increase the rate of diffusion of the dyestuff so that the samples containing a substance resistant to hydrolysis (e. g., melamine resin) show an increase in the amount of dye picked up.

Procedure III—Pretreat the samples using 200 ml. of solution "A" (NaOH) for every gram of paper for 5 minutes at the boil. Rinse the sheets carefully in three 500 ml. portions of cold water, and then perform the dye test as described in "Procedure II."

The pretreatment included in Procedure III removes most of the nitrogenous substances likely to be present in wet strength paper, except melamine resins.

In developing the three specific dyeing procedures described above, the dyebath to paper ratio and time of treatment were chosen arbitrarily. As further experience is gained, it is quite possible that modifications of these conditions may be found convenient.

4. *Interpretation of Results*

Although good results in differentiating various additives that may be present in wet strength paper often may be obtained, by use of the dyeing procedure just described, it is preferable to supplement the dye test results with other data before drawing final conclusions. This is particularly true in view of the wide variety of wet strength agents used in the past, and of the possibility that new materials may be encountered at any time.

A summary of the coloring effects obtained upon application of the specified dyeing procedures, to various types of wet strength paper, is shown in Table I. Before applying the dye test to unknown samples, it is suggested that known samples be treated according to the procedures described and the results compared with those shown in the table.

By inspection of Table I, it is evident that the speed of conducting the test depends upon the number of dyeing procedures that are used. This, in turn, is dependent upon the amount of information already available concerning the sample, and upon the scope of additional information desired. For example, the following specific cases illustrate some of the possible variations in approach:

Example A—If a sheet containing urea resin, melamine resin or a protein is to be differentiated from an untreated sheet, use "Procedure I." A blue coloration indicates that one (or more) of the above types of additive is present.

Example B—If urea resin and melamine resin are known to be the only two additives present in a group of papers (not a combination of the two resins in one sheet), the treatments may be differentiated from one another by performing "Procedure I" on one complete set of samples and then "Procedure II" on another set. The sheets containing melamine resin would show an *increase* in blue color upon performing the second test, while the sheets containing urea resin would show a *decrease* in blue color.

Example C—If melamine resin-treated paper is known to be present along with protein treated paper (both materials not present in one sheet), for a quick test perform "Procedure III." The melamine resin-treated samples would show an intense blue color whereas the others would possess only a faint blue color, if any. However, should the amount of resin present in a sheet be quite small, only a light blue color would be obtained and doubt raised as to the meaning of the test. In such case, "Procedure II" should be performed on another set of samples. The presence of melamine resin in a sample would be substantiated if both pieces showed the same intensity of color.

In many cases specific data concerning the samples may not be available and then, of course, all three dyeing procedures should be applied. It will be noted that the technique as described is specific so far as indicating whether or not melamine resin is present. If, however, melamine resin and some other material, such as urea resin or a protein, are present in the same sheet, the dyeing tests may not show the specific nature of the second constituent. It would then be necessary to rely upon some other type of test to obtain such information.

The "dye test" as described has been applied to a variety of "known" samples, with surprisingly good results to date. In only one case has an apparent discrepancy been observed. This particular sample was a laboratory prepared unbleached kraft sheet containing casein which had been hardened with an excess of formaldehyde. Upon application of dyeing "Procedures II and III" to separate pieces, it was found that contrary to expectation, there was no difference in the intensity of the blue color developed. It is believed that the caustic pretreatment of Procedure III was not adequate for removing the casein in this in-

TABLE I.—Dye Staining Results

Wet Strength Additives Present	Color of Treated Paper		
	Procedure I	Procedure II	Procedure III
Melamine resin only	Blue	More intense blue	Same as in II
Urea resin only	Blue	Less intense blue, or colorless	Same as in II (Sample may be defibered)
Protein only	Blue	Blue-intensity variable	Colorless (Sample may be defibered)
None	Colorless*	Colorless	Colorless

*A sheet containing alum and rosin size may show a faint blue coloration.

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stance, but that a more severe pretreatment might have done so.

Obviously, the dyeing technique would not be used for testing deeply colored, beater dyed papers. Also, difficulty might be found in testing unbleached kraft papers containing very small amounts of resin.

Xanthydrol Test for Urea and Thiourea—

—The procedures discussed above have all involved color reactions, resulting from the application of the reagents to the sample as received, or to isolated fractions. As an example of a different type of technique, i. e., derivative formation, let us now consider the xanthydrol test.

Xanthydrol condenses with urea (and thiourea) to give crystalline derivatives with well-defined chemical and optical properties. Under suitable conditions the reaction is quantitative and has been used by Fosse and co-workers (See Werner, E. A., *The Chemistry of Urea*, 1st ed., p. 193, New York, Longmans Green and Co., 1923) for the estimation of urea in biological fluids.

Melamine does not interfere since it gives no precipitate with xanthydrol. However, a sheet containing melamine resin will often yield some of the free base (melamine) on hydrolysis, so that the analyst will find it worth while to examine any residues microscopically.

Many amides react with xanthydrol to give crystalline derivatives, as reported by Philips (*J. Am. Chem. Soc.*, 65, 1355, 1943). Such compounds are unlikely to be found in wet strength paper but might conceivably occur in sheets treated with special wetting agents, softeners, or emulsions. Even if present, these compounds cannot be confused with urea because of the characteristic nature of the respective optical properties.

The success of the test depends on the formation of free urea, making it necessary in the present application to remove the resin from the sheet and to hydrolyze polymers to urea. Ideally, the process should convert all of the resin to urea and then go no further. Actually, however, any hydrolytic process strong enough to break down the resin will also decompose some of the urea so formed. This necessity for compromise prevents use of the method as a quantitative tool.

The detailed technique as worked out in this laboratory is as follows:

Slurry 1 to 2 grams cut paper with 40 ml. glacial acetic acid and 15 ml. water for 0.5 hour just below the boiling point. Filter, cool to 25 C., and if a precipitate forms filter again, using small amounts of acetic acid for washing. To 45 ml. clear filtrate slowly add 5 ml. of an 8% solution of xanthydrol (Eastman No. 1559) in methanol. Identify the precipitate by reference to Figs. 2 through 5. If desired, the precipitate may be filtered, washed with ethanol, and dried 1 hour at 100 C. The weight divided by seven gives the weight of urea. The remaining portion of the acetic acid extract may be evaporated and examined for melamine along with the extracted fibers.

As an alternative extraction method, good results have been obtained by leaching out the urea with boiling water, as follows:

Slurry 2 gram pulp with 750 ml. water, evaporate to 15 ml., filter, add 30 ml. glacial acetic acid and proceed as above.

The xanthydrol test has proved satisfactory for use with a variety of paper products as well as with some textile fabrics and plastics. In an extreme case, urea was successfully identified in a 0.2 gram sample of paper which had been treated with 2% melamine resin in the beater and 2.5% urea resin in the tub. It should be noted that in certain instances it may be necessary to concentrate the solution after the addition of the xanthydrol,

CORRECTION

The abridgment of convention paper entitled "Waste Water Utilization by Clarification," by Charles Carpenter and Cover G. Porter, which appeared in this section of the August (1945) issue, contained an error. The last sentence of the abridgment, on page 774, should have read "Based on 1000 gallons per minute, the resulting cost is $0.005 per thousand gallons." The cost was inaccurately stated as $0.51 per thousand gallons.

in order to facilitate the separation of the crystals. In extreme cases, crystals can be obtained by evaporation almost to dryness, followed by recrystallization from a 60:40 dioxane-water solution.

Remarks

The complementary nature of the various techniques is clearly evident, since no one method or class of methods can furnish a complete answer. Even a collection of procedures such as has been suggested is, at best, a preliminary and incomplete approach to this rather complex problem. It is hoped, however, that the publication of this method of attack will prove to be of some assistance, and will serve to stimulate development of improved methods.

Acknowledgment

The authors wish to acknowledge the contributions of Drs. T. G. Rochow, J. K. Dixon, and W. B. Innes, Messrs. C. H. Benbrook, H. P. Wohnsiedler, C. S. Maxwell, Mrs. H. L. Clapp and Miss J. E. Murphy; also the suggestions and advice of Mr. C. G. Landes in the preparation of the manuscript. Permission of the American Cyanamid Company to publish this material is greatly appreciated.

Pulp-Reinforced Plastics[1]

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INTRODUCTION

During the last few years, there has been considerable effort to supplement the widely used molded products made with wood-flour filled phenolic resin with something of better mechanical strength, principally in regard to impact strength. For the most part, the trend has been to supplant the wood flour with a material more fibrous in nature. Products already on the market are produced from cotton-flock-filled phenolic resins, macerated-fabric-filled phenolic resins, chopped-tire-cord filled phenolic resins, diced-resin-filled paperboard, resin-impregnated or filled-sisal fiber, and resin-impregnated or filled-pulp forms.

The last two materials are unique in that they may be formed to the approximate shape of the article prior to molding. Such preforms may be much larger than would be practicable in a process depending on flow of the molding material. In this manner, one large motorcar company was able to make experimental trunk doors and fenders using pulp preforms. The publicity given this experiment has aroused widespread interest. The pulp-forming process had been developed prior to this experiment, however, and one pulp-molding company has been marketing such products for several years with considerable success. Another pulp molder has just started to turn out pulp-preformed plastics. Considerable research is now under way in this field.

This report presents the results of work at the Forest Products Laboratory on several types of wood pulps and resins and indicates the possibility of making considerable improvement in the properties of this type of plastic.

Literature

Little information is given in the literature regarding pulp-reinforced plastics. Parsons ("Molded Pulp Resin Products," *Modern Plastics* 19, No. 2:45, October, 1941) described a commercial pulp plastic and gave mechanical properties of the material. In a later publication (Parsons, W. E., "Down-East Handwheels for Destroyers," *Modern Plastics* 20, No. 12:61, August, 1943), he disclosed the application of the material to handwheels for destroyers. Haslanger and Mosher ("Phenolic Resin-Pulp Preforms," *Modern Plastics* 20, No. 11:76, July, 1943) described their pulp-preform research and also some of their experimental results. The process was briefly explained by Young and Box ("Pulp Preforming and Molding," *Modern Plastics* 21, No. 4:116, December, 1943) who pointed out some of its advantages and application to manufacture of plastic diaphragms used in communications systems. The Plastic Catalogues for 1943 and 1944 contain brief sections under the heading "Phenolic Pulp Products," and give descriptions and photographs of marketed pulp plastics.

Terms and Definitions

Since considerable confusion in terminology exists in this class of plastics, the following expressions and definitions are suggested and are so used in this report:

A pulp-reinforced plastic is a plastic with paper pulp introduced into the composition in a form other than as finished sheets of paper.

A pulp preform is a mass of resin-containing pulp ready to be molded into a plastic. Preforms may be of two kinds.

Shaped preforms are those bearing the shape of the finished molded article, either crudely or quite exactly, as contrasted to pulp preforms existing only as simple blanks that are subsequently flowed to more or less intricate shape.

Pulp forming is the process of producing a pulp shape, commonly called pulp molding or sometimes felting. It is referred to as pulp forming so as not to confuse this operation with the final plastic molding.

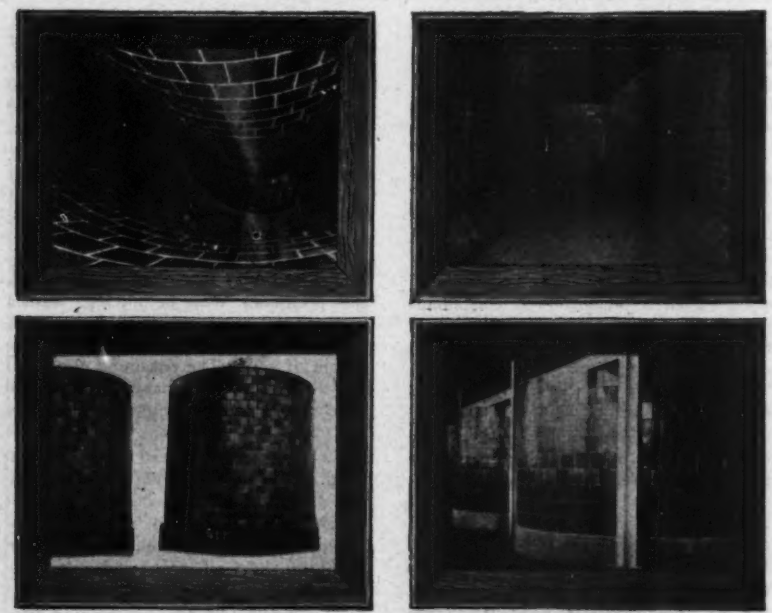
Suction-formed pulp is sucked onto a wire screen with one side of the wire exposed to the pulp slurry.

Pressure formed is the name of the process whereby pulp slurry is entirely confined by the container and one or more movable forces.

The resin is generally introduced into the pulp in one of two ways. If a suspension of powdered resin in water or a resin emulsion is added to the pulp slurry prior to the pulp-forming operation, the preform is said to be resin filled, while if the pulp form is first made and then dipped into a solution of resin in water,

[1]Abridgment of Report No. R1461 of the same title.

*Maintained at Madison 5, Wisconsin, in co-operation with the University of Wisconsin.



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alcohol, or other solvent, the preform is said to be impregnated. A third method, not common but sometimes used with lignin-enriched pulps, is to add a solution of phenolic resin in water to the pulp slurry and to depend an adsorption for retention of the resin.

Materials

The pulps used in this work were:

Forest Products Laboratory high-strength black spruce kraft.

A commercial black spruce kraft.

Forest Products Laboratory yellow birch neutral sulphite.

Forest Products Laboratory white spruce ground wood.

Commercial Mitscherlich sulphites.

The black spruce kraft pulps made at the Laboratory were specially prepared for producing high-strength phenolic resin laminates and the Mitscherlich pulps were those used in making an aircraft-grade laminate. The yellow birch neutral-sulphite pulp was included because this species and process are known to produce exceptionally strong hardwood pulps. The spruce groundwood was a newsprint grade slightly above average in strength. The physical and chemical properties of the pulps are given in Table 1.

Table 1—Physical and chemical properties of pulps used in the preparation of pulp-reinforced plastics

Pulp type	Cook or grinder run	Shipment	Processes (Schopper-Riegler)	Bursting strength	Tearing strength	Tensile strength	Density	Folding endurance	Shrinkage		Lignin	Total pentosans	Chlorine No.
									Total	Alpha			
	No.	No.	No.	Points per lb. per ream	No. per lb. per ream	lb. per sq. in.	No. per cu. ft.	Number of double folds	Percent	Percent	Percent	Percent	
White spruce ground wood	399	1,571	440	0.85	0.71	1,420							
Yellow birch neutral sulfite	5036-B	1,447	880 890 590	.25 1.10 1.28	.55 1.00 1.00	6,000 10,600	0.52 .51 .51	11 140 140	95.4	75.8	3.0	19.7	
Commercial black spruce kraft		1,582	880 890 590	.52 1.52 1.48	2.5 1.75 1.15	8,230 13,100 17,800	.52 .52 .57	75 1,000 1,500	93.8	76.5	3.7	13.9	0.1
Black spruce kraft	2439-B0 42-42	1,700	866 880 590	.78 1.72 1.76	1.65 1.50 1.43	9,973 13,600 17,540	.52 .52 .50	1,256 1,500 1,503	93.8	78.8	4.4	9.8	0.1
Black spruce kraft	2-2575	1,999	866 880 590	.57 1.52 1.76	2.00 1.50 1.53	8,698 12,460 17,140	.56 .56 .57	130 1,188 1,188	93.5	74.9	3.8	9.7	0.1
Commercial black spruce Mitscherlich sulfite		1,799	880 880 590	1.50 1.50 1.66	1.57 1.50 1.50	8,000 10,800 10,800	.50 .50 .50	172 650 650	93.0	79.0	9	5.1	
Commercial black spruce Mitscherlich sulfite		8,762	880 880 590	1.60 1.60 1.10	1.50 1.25 .80	8,230 11,760 11,280	.52 .45 .50	172 650 650	93.2	74.8	1.5	5.2	

A commercial black spruce kraft.

Forest Products Laboratory yellow birch neutral sulphite.

Forest Products Laboratory white spruce ground wood.

Commercial Mitscherlich sulphites.

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The resins used were: (1) powdered phenol-formaldehyde resins of a type recommended by the manufacturer; (2) lignin from paper-mill soda-process spent liquor, and (3) a resinous by-product resulting from the refining of wood rosin.

EQUIPMENT AND DEVELOPMENT OF PROCEDURES

Pulp Forming

In the work so far undertaken on unflowed pulp-reinforced plastics, only the flat disks have been made. There are several reasons for adopting this procedure. Specimens for physical tests are more readily obtained from flat panels. A shaped object requires both pulp-forming and plastic-molding dies that involve considerable expense.

Results with shaped objects, moreover, depend on the technique employed in making the shape and possibility on the shape itself. These factors complicate the study of the fundamental variables involved. The properties of a contoured piece of uniform thickness molded by applying pressure normal at all points to the surface of the preform should approximate those

Table 4—Effect of pulp type and quality on certain properties of pulp-reinforced phenolic plastics

Plastic No.	Wood pulp		No. of panels tested	Phenolic resin	Molding data			Properties[2]										
	Type	Oven-dry content			Time	Pressure	Temperature	Forest Products Laboratory toughness Flatwise	Tension				Edgewise compression				Water absorption in 24 hours[5]	Specific gravity
									Ultimate strength	Elongation[4]	Proportional limit stress	Modulus of elasticity	Ultimate strength	Yield (0.2 percent offset)	Proportional limit stress	Modulus of elasticity		
		Percent		Percent	Minutes	Lb. per sq. in.	°C.	In.-lb. per in. of width	Lb. per sq. in.	Percent	Lb. per sq. in.	1,000 lb. per sq. in.	Lb. per sq. in.	Lb. per sq. in.	Lb. per sq. in.	1,000 lb. per sq. in.	Percent	
86	White spruce ground wood run 9395	38	4	40	13	1,300	160	7	15,500	1.4	5,800	1,400	17,100	7,500	2,700	1,300	1.5	1.35
113	Do.	42	1	12	13	4,000	160	7	14,000	1.0	6,500	1,800	15,200	9,400	4,100	1,500	4.6	1.37
83	Yellow birch neutral sulfite Dig. 5036-H	55	2	39	13	3,000	160	22	23,700	2.1	5,700	1,700	16,500	6,900	2,800	1,700	1.8	1.40
74	Commercial black spruce kraft	53	4	40	13	3,000	160	19	20,100	2.1	5,300	1,600	16,500	5,800	2,300	1,400	1.9	1.39
53	Black spruce kraft Dig. Nos. (2639-40-41-42)	31	2	40	13	3,800	160	24	24,000	1.9	6,300	1,900	16,300	6,200	2,500	1,600	2.4	1.40
134 C	Black spruce kraft Dig. No. 1-2676	36	1	40	13	2,750	160	19	25,100	1.9	4,600	2,000	18,900	7,400	2,300	1,900	1.9	1.38
137	Black spruce kraft Dig. No. 1-2676	36	2	41	13	2,125	160	23	23,800	1.8	4,700	2,200	15,100	7,700	2,400	1,700	2.8	1.40
135 B	Commercial Mitscherlich. Ship. 1720	85	1	40	13	2,750	160	23	20,600	1.7	4,600	1,800	18,000	6,400	2,000	1,800	2.2	1.42
139 C	Commercial Mitscherlich Ship. 1742	52	1	39	13	1,500	170	16	19,600	1.5	7,400	1,800	17,800	7,900	3,500	1,600	3.2	1.40

1—Each panel furnished 2 tensile specimens, 4 compression specimens for ultimate strength determination, 2 compression specimens to determine elastic properties, 5 toughness specimens and 2 water-absorption specimens.

2—Properties were determined from specimens prepared, conditioned and tested in accordance with Federal Specification for Plastics, L-P-406, Dec. 9, 1942, unless otherwise noted. Machined edges were not otherwise finished prior to test. Compressive stress-strain properties were obtained by testing a 1- by 4-inch specimen as a laterally supported column. Ultimate compressive strength was obtained by testing specimens 1 inch wide by ½ inch long in pairs, 1 inch apart and parallel. Values represent the average for the indicated number of tests.

3—Forest Products Laboratory intermediate-capacity toughness machine, unnotched specimen, ⅝ inch wide by nominal ⅛ inch thickness by 3½ inches long, tested over 2½-inch span.

4—Elongation immediately before fracture, measured over a 2-inch gage length.

5—Specimens 2 by 2 by ⅛ inch in thickness.

of a flat disk provided that the pulp formation is similar in both.

Pulp sufficient for a ⅛-inch panel was charged to a 4-gallon conical-bottom copper tank, a portion of the water was added, and the pulp was mixed with a high-speed propeller-type stirrer. A slurry was next made by adding to a small quantity of water the necessary amount of powdered resin or resins, 1 to 5 grams of a suitable wetting agent, and 1 per cent zinc stearate to serve as a lubricant. This slurry was passed through an 80-mesh screen to remove lumps and was added to the pulp suspension. The whole was diluted to 1 per cent consistency, and after thorough stirring, was ready for the forming operation. When a commercially experimental lignin was employed, it was necessary to precipitate the lignin on the fiber by means of hide glue and papermakers' alum to secure adequate retention. After incorporating the lignin with the pulp, 0.5 per cent of hide glue in solution, followed by 0.5 per cent of alum (based on the total pulp and resin charge) was added to the stock while it was being stirred. Stirring was continued from 15 to 30 seconds before charging to the forming apparatus. In this way, lignin retention values of 75 to 80 per cent were secured, an amount comparable with retention values obtained with other resinous materials.

The pulp-forming mold consisted of a 2-foot long, 8½ inch diameter, cylindrical vat with a perforated plate covered with 80-mesh screen wire closing the bottom. A close-fitting hydraulically activated piston or force, the face of which was perforated and covered with 80-mesh screen wire, entered the top of the vat. Arrangement was made for applying vacuum or air pressure to both screen plates. Figure 1 shows the apparatus. In making the mat, the pulp was charged to the mold vat, was diluted to about 1 per cent consistency, and was mixed by forcing air through the bottom screen plate. The piston was then moved downward and vacuum was applied to both screen plates. At the end of the downward stroke of the piston, the vacuum on the bottom screen was cut off, air pressure was applied, and the piston, with pulp cake held on by suction, was withdrawn from the vat. The mat was then released from the piston by cutting off the vacuum and substituting compressed air.

The mats were dried for 24 hours at 35 to 40 C. (95 to 104 Fahr.) in a forced-circulation oven and then were conditioned for 24 hours or more in a 24 C. (75 Fahr.), 50 per cent relative humidity room before molding. The volatile content of the mats so treated was approximately 7 per cent, on the basis of the loss of weight of a sample heated in an oven at 110 C. (230 Fahr.) for several hours. When made for a ⅛-inch panel, the conditioned mats weighed approximately 180 grams and were ⅝ inch to ¾ inch thick.

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Table 5—Effect of pulp beating on certain properties of pulp-reinforced phenolic-resin plastics[1]

Plastic No.	Beating treatment	No. of panels tested[2]	Phenolic resin	Molding data			Properties[3]										
				Time	Pressure	Temperature	Toughness[4]	Tension				Compression				Water absorption in 24 hours[6]	Specific gravity
							Flatwise	Ultimate strength	Elongation[5]	Proportional limit stress	Modulus of elasticity	Ultimate strength	Yield (0.2 percent offset)	Proportional limit	Modulus of elasticity		
	Minutes		Percent	Minutes	Lb. per sq. in.	°C.	In.-lb. per in. of width	Lb. per sq. in.	Percent	Lb. per sq. in.	1,000 lb. per sq. in.	Lb. per sq. in.	Lb. per sq. in.	Lb. per sq. in.	1,000 lb. per sq. in.	Percent	
53	0	2	40	13	3,000	160	24	24,000	1.9	6,300	1,900	16,300	6,200	2,500	1,600	2.4	1.40
54	20	3	40	13	4,000	160	25	21,300	1.9	5,600	1,800	16,100	6,700	3,000	1,700	2.1	1.41
55	40	3	39	13	4,000	160	23	19,800	1.8	6,600	1,600	16,100	7,000	3,100	1,500	2.3	1.41
56	60	3	39	13	4,000	160	24	18,600	2.0	5,900	1,400	16,600	6,400	2,900	1,700	2.2	1.41
57	80	3	38	13	4,000	160	23	17,700	2.0	5,000	1,400	16,100	6,200	2,600	1,500	2.5	1.40

1—High strength black spruce kraft digestion Nos. 2639-40-41-42.
2—Each panel furnished 2 tensile specimens, 4 compression specimens for ultimate strength determination, 2 compression specimens to determine elastic properties, 5 toughness specimens and 2 water-absorption specimens.
3—Properties were determined from specimens prepared, conditioned and tested in accordance with Federal Specifications for Plastics, L-P-406, Dec. 9, 1942, unless otherwise noted. Machined edges were not otherwise finished prior to test. Compressive stress-strain properties were obtained by testing a 1- by 4-inch specimen as a laterally supported column. Ultimate compressive strength was obtained by testing specimens 1 inch wide by ½ inch long in pairs, 1 inch apart and parallel. Values represent the average for the indicated number of tests.
4—Forest Products Laboratory intermediate-capacity toughness machine, unnotched specimen, ⅜ inch wide by nominal ⅛ inch thickness by 3½ inches long, tested over 2½-inch span.
5—Elongation immediately before fracture, measured over a 2-inch gage length.
6—Specimens 2 by 2 by ⅛ inch in thickness.

the pulp mats in an 8½ inch diameter disk mold. The mats, though 8½ inches in diameter when wet, shrunk various amounts on drying, depending on the kind of pulp and the degree of processing the pulp had received. As a result, some of the mats were confined at their periphery during molding while others were required to flow. Moreover, the mold used was cumbersome to handle and its use was time consuming, consequently cauls were employed.

To demonstrate the practicability of molding between cauls, several panels were made and their properties were compared with similar mats molded in a disk mold. The cauls used were stainless steel and the molding was done in a 14-inch by 14-inch steam-heated 125-ton capacity press.

The molding schedules varied with the type of pulp and resin, and with the amount of resin. Practically all straight phenolic-pulp plastics were cured for 13 minutes at 160 C. (320 Fahr.) and were drawn hot. The pressing pressure used depended on the composition being molded. Lignin, wood-rosin by-product, lignin and wood-rosin by-product, and lignin wood-rosin by-product phenolic-resin pulp plastics were molded under conditions that appeared to be adequate. These plastics were chilled to below 100 C. (212 Fahr.) by cooling the platens before the pressure was released. The recorded molding time was the time the plastic was under pressure at the stated molding temperature.

EFFECT OF PULP TYPE AND QUALITY

Some properties of the plastics made from a variety of pulps and phenolic resin are given in Table 4. In all tests, the chemical-pulp plastics gave good tensile strengths, the range being from 20,000 to 25,000 pounds per square inch. These plastics had good toughness values, though the Mitscherlich-pulp plastics 135B

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Fig. 1—Apparatus for forming resin-filled pulp mats

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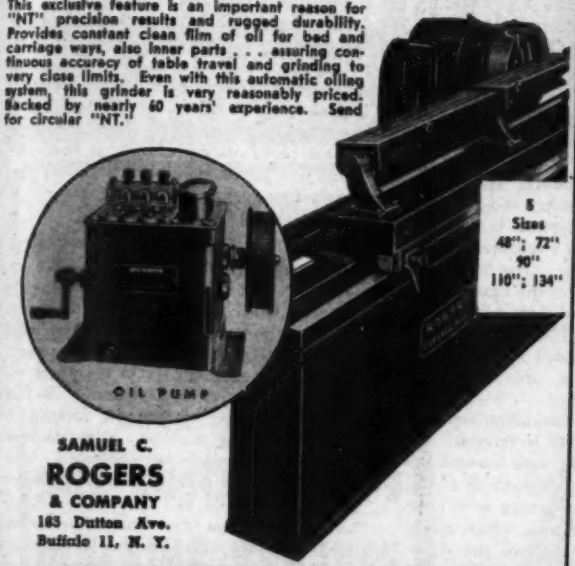

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and 139C were appreciably lower. With these Mitscherlich pulps, blistering was experienced, especially when a type of resin which becomes fluid during molding was used. This may have been due to the pH of the pulp affecting the curing of the resin. (Hanson, N. D. and Wilson, Perry. Resins for Paper Base Laminates, *Paper Trade Journal* 118, No. 15:48, April 13, 1944). It could be overcome by increasing time or temperature of cure or possibly by decreasing volatile content. The yellow birch neutral-sulphite plastic 83 was among the best in spite of the characteristically short fiber of the hardwood. The proportional limit in tension considerably exceeded that obtained with the other plastics.

The groundwood pulp plastics 86 and 113 had moderately good tensile strength but the toughness was considerably lower than that of the chemical-pulp plastics. Plastic 113 was noteworthy in that, while the resin content was only 12 per cent, the properties, except for water absorption which was increased approximately three times by the reduction in resin, were comparable to plastic 86 containing 40 per cent resin. The low resin material was molded at 180 C. (354 Fahr.) in an attempt to obtain a stabilization of the fiber, such as occurs in forming "Staypak," the Laboratory's compressed heat-stabilized wood. This seems to have been accomplished, for the plastic did not disintegrate even on prolonged soaking. Where high water resistance is not essential, such low-resin products should have commercial application for low-cost, high-strength plastic panels.

It is difficult to correlate strength properties of the plastics with the potential papermaking properties of the pulps. The pulp mats before molding are bulky and weak, and apparently little fiber bonding exists. Presumably, therefore, strength, as manifested in a sheet of paper, is much less important than the intrinsic strength of the fiber and the surface characteristics which influence adhesion of resin to the fiber.

EFFECT OF BEATING THE PULP

Unbeaten Forest Products Laboratory high-strength kraft pulp and several batches of the same material beaten 20, 40, 60, or 80 minutes in a test beater were converted to pulp plastics. The Schopper-Riegler freeness values on the beaten pulp were 865, 810, 795 and 745 cubic centimeters, respectively. The phenolic-resin content was in all plastics approximately 40 per cent. Results are shown in Table 5.

Beating lowered the maximum strength and modulus of elasticity in tension. At 80 minutes, these values were lowered approximately 25 per cent from those of unbeaten pulp. Other properties were practically unaffected. Beating, while aiding in the retention of resin, had the disadvantage of increasing the time of forming the mats.

EFFECT OF TYPE OF RESIN

Phenolic Resin Plastics

Table 6 shows the results obtained by varying the kind of phenolic resin in kraft-pulp plastics containing 40 per cent resin. The resins differed in their fluidity during molding. In the fourth column of the table, numbers indicating this fluidity, which were assigned by an experienced observer, are given. Higher numbers were assigned to the more fluid products. Good plastics were obtained with all resins. In spite of the fact that the molding conditions might not have been optimum in all cases, only slight significant differences in plastic properties resulted. There appeared to be a tendency for the more fluid products to give a higher proportional limit in compression. Apparently good products can be obtained from a variety of powdered phenolic resins, the choice of resin being controlled by factors such as suspension characteristics and molding schedules rather than properties of the finished product.

Lignin Plastics

Pulp plastics made with lignin in place of phenolic resin were decidedly inferior in properties. With approximately 40 per cent lignin content, ultimate tensile strengths were reduced to about a third and ultimate compressive strengths to about half of the values obtained with phenolic plastics. The lignin plastics also had lower toughness and considerably higher water-absorption values. The commercially available lignin gave inferior products in regard to water resistance as compared to the commercial experimental lignin. This is presumed to have been caused by poorer dispersion of the commercially available lignin, which was coarsely grained, as contrasted with the almost colloidal nature of the commercial experimental lignin. Blistering tended to occur with the commercial experimental lignin but this was overcome by pre-compressing the mats before molding, thereby eliminating a portion of the air which might otherwise be entrapped.

From these results it does not appear that lignin is a very promising binder for pulp plastics in spite of the fact that good lignin laminates have been produced at the Laboratory. Probably the ability of the lignin to cement the fibers together is low so that paper strength, such as that obtained in a paper laminate, is necessary for a high-strength lignin product.

Wood-rosin-byproduct Plastics

Wood-rosin by-product plastics were slightly inferior to the lignin plastics in ultimate tensile and compressive strengths and were worthless for exposure to water. Fuzzy edges were left in machining and the plastics appeared poor on inspection. Slight bending caused cracks to appear on the tension side of the specimen. It was difficult, moreover, to prevent sticking to the cauls during molding. Nevertheless, high toughness values were obtained. Apparently the resin disintegrates to a powder under light loads and the fibrous structure, freed from the embrittling resin, hangs together with considerable tenacity until the specimen is greatly deformed.

Lignin and Wood-rosin-byproduct Plastics

Pulp plastics containing approximately 40 or 50 per cent total resin were made with 3-to-1 and 1-to-1 lignin and wood-rosin by-product mixtures. These plastics had, in general, higher strength properties, especially ultimate tensile strengths, than straight lignin plastics, but water absorption values were higher and increased with increasing wood-rosin by-product content. As with straight wood-rosin by-product plastics, the high toughness values are believed to be somewhat misleading. Commercial experimental lignin and wood-rosin by-product plastics were, in general, more water resistant than the commercially available lignin and wood-rosin by-product plastics. Increasing the molding temperature from 160 to 170 C. (320 to 338 Fahr.) improved the water resistance of the commercial experimental lignin plastics slightly but left much to be desired as far as this property is concerned.

Lignin-wood-rosin Byproduct Phenolic-pulp Plastics

Commercially available lignin-wood-rosin by-product phenolic-resin pulp plastics containing approximately 40 or 50 per cent total resin were made in mixtures with a ratio of 6-to-1 to 1 and 4 to 2-to-2. These combinations, when molded at 160 C. (320 Fahr.) showed little if any improvement in properties over those of the lignin wood-rosin by-product mixtures. Increasing molding temperatures improved ultimate tensile and compressive strength somewhat and decreased the water absorption considerably. There are two possible explanations of the decrease in water absorption with increase in temperature: (1) The increased temperature overcomes a tendency of the lignin or wood-rosin by-product to retard the cure of the phenolic resin or (2) the increased temperature

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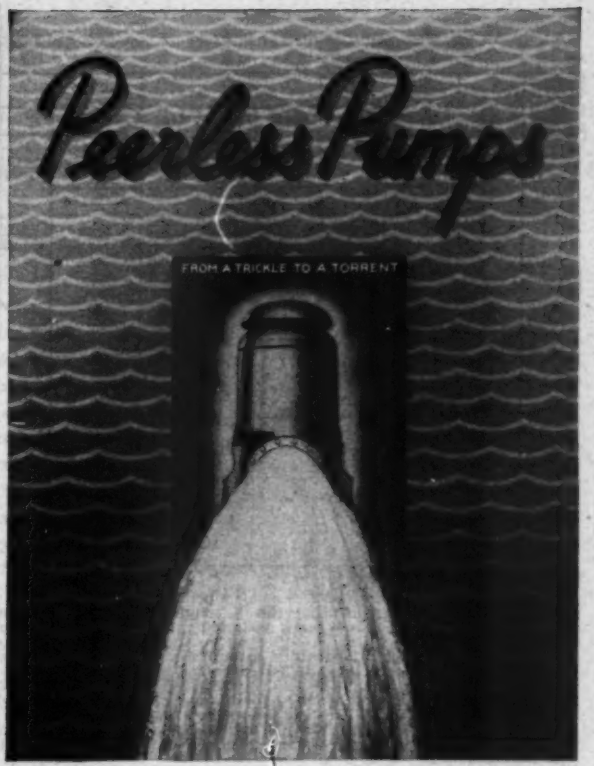

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Table 6—Effect of the type of powdered phenolic resin on the properties of pulp-reinforced plastics

Plastic No.	No. of panels tested[1]	Phenolic resin		Molding data			Properties[5]									
		Relative fluidity[2]	Amount	Time	Pressure	Temperature	Forest Products Laboratory toughness[3]	Tension			Edgewise compression				Water absorption in 24 hours[6]	Specific gravity
							Flatwise	Ultimate strength	Elongation[4]	Proportional limit stress	Modulus of elasticity	Ultimate strength	Yield (0.2 percent offset)	Proportional limit stress	Modulus of elasticity	
			Percent	Minutes	Lb. per sq. in.	°C.	In.-lb. per in. of width	Lb. per sq. in.	Percent	Lb. per sq. in.	1,000 lb. per sq. in.	Lb. per sq. in.	Lb. per sq. in.	Lb. per sq. in.	1,000 lb. per sq. in.	Percent	
Commercial black spruce kraft, Shipment No. 1982.																	
79	2	4	40	13	2,500	160	23	21,900	2.2	5,900	1,800	15,900	7,300	2,700	1,700	2.4	1.41
84	2	4	40	13	1,500	160	19	22,500	2.1	6,500	1,600	15,500	7,000	2,600	1,400	2.3	1.40
81	2	4	40	13	3,000	160	22	21,900	2.1	6,600	1,800	16,300	7,100	2,500	1,700	2.5	1.40
85	2	4	41	13	2,000	160	20	20,900	2.2	6,100	1,600	15,400	6,900	2,500	1,500	2.5	1.40
80B	1	3	41	13	2,500	160	24	21,700	2.1	6,200	1,800	16,400	6,600	2,600	1,600	2.2	1.39
74	4	2	40	13	3,000	160	19	20,100	2.1	5,300	1,600	16,500	5,800	2,300	1,400	1.9	1.39
82	2	1	40	13	3,000	160	23	22,200	2.3	5,800	1,700	17,400	5,900	2,000	1,600	2.2	1.39
High strength black spruce kraft, Big. No. I-2676.																	
137	2	4	41	13	2,125	160	23	23,600	1.8	4,700	2,200	15,100	7,700	2,400	1,700	2.8	1.40
136	1	2	40	13	2,750	160	19	25,100	1.9	4,600	2,000	14,900	7,400	2,300	1,900	1.9	1.38

1—Each panel furnished 2 tensile specimens, 4 compression specimens for ultimate strength determination, 2 compression specimens to determine elastic properties, 5 toughness specimens, and 2 water-absorption specimens.
2—Numerals from 1 to 4 were assigned this fluidity by an experienced observer; the higher numbers being assigned the more fluid products.
3—Forest Products Laboratory intermediate-capacity toughness machine, unnotched specimen, ¾ inch wide by nominal ⅛ inch thickness by 3½ inches long, tested over 2½-inch span.
4—Elongation immediately before fracture, measured over a 2-inch gage length.
5—Properties were determined from specimens prepared, conditioned and tested in accordance with Federal Specification for Plastics, L-P-406, Dec. 9, 1942, unless otherwise noted. Machined edges were not otherwise finished prior to test. Compressive stress-strain properties were obtained by testing a 1- by 4-inch specimen as a laterally supported column. Ultimate compressive strength was obtained by testing specimens 1 inch wide by ½ inch long in pairs, 1 inch apart and parallel. Values represent the average for the indicated number of tests.
6—Specimens 2 by 2 by ⅛ inch in thickness.

may cause physical and chemical changes in the pulp. Whereas there is considerable spread in water absorption values with the various combinations molded at 160 C. (320 Fahr.) when molded at 180 C. (354 Fahr.) the water absorption values of the several mixtures are approximately the same.

Lignin-phenolic Plastics

Table 10 shows the properties of plastics containing approximately 40, 45, or 50 per cent total resin in which lignin-phenolic mixtures with ratios of 3-to-1, 3-to-2, and 1-to-1 were used. The phenolic resin generally employed was one of the more fluid types. The incorporation of even one part phenolic resin to three parts lignin in a 40 per cent total-resin plastic produced materials far superior to straight lignin-pulp plastics. With 1-to-1 combinations, the properties approached those of the phenolic plastics. Water-absorption values were higher than with straight phenolic plastics, but were within reasonable limits. All in all, the lignin-phenolic pulp plastics appear quite promising.

Fortified Hydrolyzed-wood Plastics

Hydrolyzed wood produced from chips by the Laboratory's acid process is pulp-like in nature, will mold without supplementary resin, and has fair flow properties. The plastic, however, is lacking in strength and toughness.

The incorporation of kraft pulp, to the extent of 14 per cent, appreciably improved the toughness and tensile strength of the hydrolyzed wood plastic. To get a major improvement, however, would apparently require a high content of kraft.

EFFECT OF RESIN CONTENT

Increasing the resin content of the pulp mats greatly decreased the pressure required to mold them. With phenolic resins, an increase of the resin content from 32 to 58 per cent decreased the required molding pressure from 3,750 to 1,000 pounds per square inch. This effect on ease of molding is further evidenced by the flow, as measured by the increase in the diameters of the plastic disks over the diameter of the unmolded mats. On the basis of the diameter increase, expressed in inches per 1,000 pounds per square inch applied pressure, the plastic flow would be approximately doubled by raising the resin content from 40 to 50 per cent, and quadrupled by raising it from 40 to 60 per cent.

Maximum tensile strength, modulus of elasticity, and proportional limit values dropped with increasing resin content. Haslanger and Mosher (Phenolic Resin-Pulp Preforms, *Modern Plastics* 20, No.

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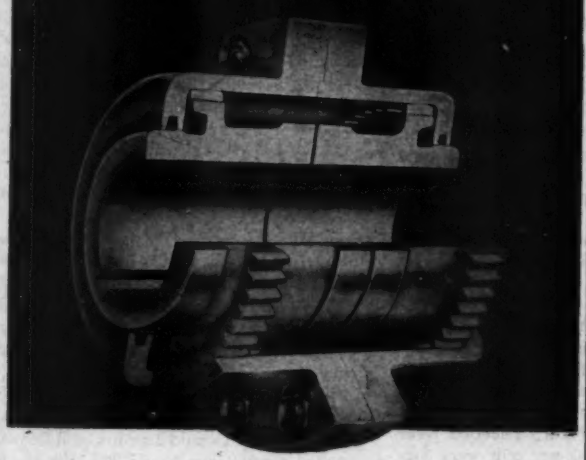

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11:76, July, 1943) found little variation in maximum tensile strength with kraft-pulp reinforced plastics containing 15 to 55 per cent phenolic resin. All the tensile strength values they obtained, however, were rather low, 12,000 to 13,000 pounds per square inch, and were obtained from specimens cut from a preformed rectangular panel molded at 880 pounds per square inch pressure.

Maximum compressive strength values were fairly constant with varying resin content except with the lowest resin content. The specific gravity, water absorption, and toughness values dropped with increasing resin content.

FIBER BONDING AND FIBER FORMATION

Three experiments were made in an attempt to determine the factors involved in producing high-strength pulp plastic. It is reasonable to suppose that high tensile strength of the individual fibers is necessary. In paper and board, the orientation of fibers is important as well as the fiber-to-fiber bond established in drying the fibrous mass from the wet state.

In the first experiment, wet kraft pulp was dehydrated by treating it successively with alcohol, acetone, and benzene and then evaporating the benzene. By this means, a bulky mass of fiber was obtained that substantially lacked fiber-to-fiber bonding. Powdered phenolic resin to the extent of 40 per cent was then mixed with the pulp. The mixture was molded into a 4¼-inch diameter disk. The plastic had a tensile strength of only 12,400 pounds per square inch and a toughness of 13 inch-pounds per inch of width. In the second experiment an 8½-inch diameter air-dry pulp mat containing 41 per cent resin was placed in an atmosphere of acetone for about 15 hours. The absorbed acetone caused liquefaction of the resin which flowed and coated the fibers. This method of fixing the resin to the fiber may have a practical application. After drying, the mat was broken in a shredder without apparent resin loss. Disks of 4¼-inch diameter were molded from portions of the fluffy mass. Molding was difficult and fine surface resin streaks could not be avoided. The plastic had a toughness value of 11 inch-pounds per inch of width and a tensile strength of 13,900 pounds per square inch. In these two experiments there was little opportunity for orientation of the fibers. In the third experiment, the procedure used in the second was repeated but instead of molding the shredded pulp directly, it was suspended in water and remade into an 8½-inch diameter mat in the usual manner, promoting a high degree of horizontal orientation of fibers. By this treatment the resin content was reduced to 38 per cent. The resulting mat was soft and appeared to have decidedly less fiber-to-fiber bonding than the usual product. The plastic had the following properties:

Maximum tensile strength — 22,400 pounds per square inch;

Modulus of elasticity in tension—1,990,000 pounds per square inch;

Maximum compressive strength—15,200 pounds per square inch;

Toughness—24 inch-pounds per inch of width;

Water absorption—2.8 per cent.

These experiments, though not conclusive, tend to indicate that fiber-to-fiber bonding plays only a minor role in giving strength to pulp plastics but that fiber felting or mat formation is important.

PLASTICS FLOWED FROM PULP PREFORMS

The molding of a cup-or box-shaped object with vertical side walls from a shaped-pulp preform presents difficulties. Either the side walls of the preform need to be high (3 to 5 times that of the molded object) or bag molding or expanding dies must be resorted to. Such objects may be flowed from flat-pulp preforms. Molding with such material is not so readily carried out as when conventional molding compounds are used. Uniform heating of the preform is essential. Probably thin walls and large distances of flow would be difficult, though high frequency heating should be helpful. The composition of the preform is important. If an attempt is made to improve flow by using excessively high resin content or too fluid a resin, resin pockets are apt to occur. Phenolic resin contents as low as 30 per cent were successfully used though generally a content of 40 to 50 per cent was desirable. Lignin-phenolic mixtures flowed well. Preforms made from cotton linters and also from long-fibered pulps made by cooking and beating caroa fiber and flax were successfully flowed.

On examining the polished section of a plastic flowed from a pulp preform, more or less regular and distinct flow lines may be observed. Turbulence in these lines is apt to be associated with a seam or resin pocket.

COMPARISON OF EXPERIMENTAL PULP PLASTICS WITH COMMERCIAL PLASTICS

A comparison of some of the materials produced in this work with several commercial plastics, using the same test procedure, is given in Table 12. Both the kraft and yellow birch neutral-sulphite-pulp phenolic-resin plastics equal the aircraft-grade paper laminate in toughness and water resistance and are roughly three-quarters as strong in tension and compression. The sisal plastic approaches these plastics in toughness but is considerably lower in other strengths while the cord-filled plastic is considerably lower in both toughness and tensile strength. A marked advantage in toughness and tensile strength is shown by the pulp plastics over the wood-flour-filled phenolic product, but wood-flour plastic excels in compressive strength and water resistance.

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It is often said that ours is the age of specialization. In specialization, great individual differences develop. Thus, it is not infrequent to find in a given gang of workers engaged on the same type of production that the poorest worker retained is able to turn out about one-fourth the quantity of the best worker in the same gang.

In one of his books on applied psychology (How to Use Psychology in Business, page 32), Dr. Donald Laird, a well-known applied psychologist, says, "The differences between the best and the poorest operators, coming close to a two-to-one ratio on the average, should cause some serious thought about our too implicit faith in the power of the machine."

(*) Abridgment of paper delivered before the Greater Chicago Conference of the National Association of Personnel Directors, Chicago, May 16, 1945.

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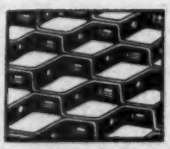

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For several decades the stress in the study of success was on ability. Someone has defined ability as "what you have that nobody recognizes." However, more recent studies reveal quite clearly that persons of mediocre talent may succeed in a job if interest and motivation are high enough. Some folks believe that interest is the backbone of ambition; ambition, of course, is that itching sensation caused by inflammation of the wishbone. Abilities may be considered as of four general types: Physical, mental, mechanical and social; it is frequently possible to describe job requirements in terms of these four abilities. It is relatively a simple matter to determine the extent of an employee's interest in working with people, with ideas, with numbers or with physical things. More difficult, but nevertheless feasible, is an analysis of the accents of interest required by various jobs.

Over recent decades much progress has been made in the development of aptitude testing. Unfortunately, less development has been made in two directions which should have paralleled the aptitude testing progress. The first need has to do with job analysis. It is likely that the analysis of human beings by means of aptitude testing is more advanced than the corresponding analysis of jobs. As we improve in our ability to analyze job requirements, we will make more possible the matching of human qualifications against job demand.

Most individuals, at all levels of an organization, lack certain traits desirable for job performance. If there are too many of these deficiencies, the employee is obviously unfitted for his job. However, where there are only a few deficiencies, the employee will endeavor to cover up and will resort to evasion, procrastination, alibis or other defense mechanisms in his relationship with the work at hand. Many of the maladjustments of employees to their jobs show themselves in strange directions. We normally call some of these directions bad morale. The proof of this observation can be seen in individual cases of employees who are noted for raising hell with everyone and everything but who, upon transfer to work for which they are better fitted, almost immediately become contented, loyal and dependable employees.

We know too little about many of the intangible forces which impinge upon people at work. In the decades ahead we can confidently look for great light to be thrown upon such problems as employee motivation, the significance of temperament, personality attributes, interests, total situation psychology, monotony, spiritual values, group spirit and leadership. Industry faces a mass vocational guidance for the servicemen and war workers who are to be absorbed in the next two or three years. Industry cannot rely on the old dull tools which have already proven ineffective. It must seek new and sharper tools.

In summary, let me give five principles of adjustment which may be of use:

1. Applicants and employees vary greatly as to their abilities and interests.

2. Jobs vary greatly in their demands as to abilities and interests.

3. Standards and objective measuring devices, such as aptitude tests, are desirable in improving adjustment of employees to their jobs.

4. Maladjustment contributes to lowered morale.

5. Industry must accept the responsibility for adjusting employees to their jobs —particularly returning servicemen and displaced war workers.

Prerequisites for Indirect Incentives*

C. T. DUNN, Vice President
Albert Ramond and Associates, Inc.

Since incentives are acceptable in principle and produce desirable results, it is reasonable to wish to expand their use to include the entire personnel of an industry. Efforts to extend the incentive coverage has often led to wierd schemes of expediency too diverse to outline here. Some Union spokesmen have stated that no incentive system can stay unless all factory workers participate. A candid engineer will state that no incentive plan should exist as a subterfuge for plant-wide general increases and, further, no incentives should exist except on a rational basis of measurement of individual or group accomplishment. Wise management will shun other proposals as sure harbingers of great future trouble.

Installation engineers are required to go as far as possible in meeting the desired objective of rational incentive plans covering the greatest possible percentage of the factory workers; and figures as high as 95 per cent of the manhours in productive departments are common. However, this is only attainable when service men, truckers, adjusters, cranemen and foremen can also be included in the plan. Inclusion of these indirect workers is a powerful factor in the elimination of functional delays of all sorts within the department and plant.

At the end of the list of directly productive departments will be found several service departments such as interdepartmental trucking, receiving, stores, shipping, tool room and maintenance shops. The question is—where do they fit into this picture of providing incentive opportunity for all workers? Experience to date indicates that under favorable conditions the benefit of incentive wage payment can be extended to a large percentage of this type of plant activity.

Much more than engineering technique is involved in the ability to carry out successfully a program of applying incentives to indirect workers under present social and economic conditions.

The single fact that the plan must operate on a voluntary basis means that it must be salable to each group affected as a fair and related measure of the effort of that group. Changes in working conditions, equipment, product and materials are certain to be made in these service departments as time passes. The plan must be expressed in sufficient detail to permit adjustment for these changes, or it is certain to fall into disrepair and be a source of discontent and trouble. This factor alone precludes extreme simplicity if the plan is to be of permanent utility.

The records (existing or possible) of production and time distribution have a major bearing upon the use of incentives in this type of department. The degree of precision possible in the establishment of indirect incentives opens up several other factors that must be given due consideration.

Historically it has been recognized that prior to the use of incentives every possible effort should be made to standardize working conditions surrounding the job and that following such standardization a direct or "one for one" relationship should exist between production and credit, either money in the case of piece work, or standard time in case a premium plan is employed. Further, it has been recognized that where non-standardized conditions existed, the only safe type of incentive was one of several widely known gain-sharing plans (Rowan, Halsey, Emerson, etc.). Plans of this type do not create a strong incentive for the maximum contribution of effort, and are today subject to wide criticism, with the added charge that they are unfair to labor. Be-

(Turn to page 964)

*From an address entitled "A Wage Incentive Application for Indirect Workers," given before the Society for the Advancement of Management, Detroit, Michigan, May 9, 1945.

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NEW EQUIPMENT AND SUPPLIES

Carbon Dioxide Fire Extinguisher

American - LaFrance - Foamite Corporation, Elmira, N. Y., has announced a portable fire extinguisher, made in three different sizes (Models 15, 10, and 4), and utilizing carbon dioxide as the fire extinguishing agent. The model numbers indicate the pound capacity of the gas.

Designated as the *Alfite Speedex*, all models are approved by Underwriters' and Factory Mutual Laboratories. Models 4 and 15 also carry the approval of the U. S. Coast Guard.

The new unit is engineered to more speedily extinguished small oil or electrical fires, with no loss of the extinguishing gas on anything but the fire itself.

New Shake Mechanism For Fourdriniers

A new shake mechanism for fourdrinier machines, designated as a *Compensator*, has been announced by the Submarine Signal Co., 160 State St., Boston, Mass. Essentially the device consists of a number of coiled springs and a so-called "compensating mass" all floating on flexible mountings. One end of the spring system is bolted to the fourdrinier breast roll, or other suitable point with the compensating mass at the other end.

In operation, the shake section and the compensating mass are always moving in opposite directions and their energy is always balanced. As the springs are extended, they release their energy to both masses; as the springs are compressed, they absorb the energy of the two masses.

According to the manufacturer, with this compensator the shake head simply acts like the main spring of a watch, and supplies just a little energy during each stroke; likewise, the smooth, even motion given the shake section practically eliminates all side and back thrust; thus materially reducing pivot pin wear and unwanted vibration of the shake section and making excessively heavy foundations for the shake head unnecessary. The manufacturer also claims that with this device, it is possible to vibrate even the largest shake sections at frequencies far higher than those in use today—thus offering an opportunity to match shake speed with fast wire speeds and obtain material improvements in formation.

Hoist Drive for Cranes

A hoist drive for cranes, known as the *Maxspeed* system, has been announced by the Industrial Engineering Division of the General Electric Company, Schenectady, New York. The new drive, which automatically "measures" the load so that it is hoisted and lowered at maximum safe speed yet prevents the handling of dangerous overloads, is designed for use on either indoor overhead, slow-speed cranes, or high-speed cranes of the type used in outdoor construction.

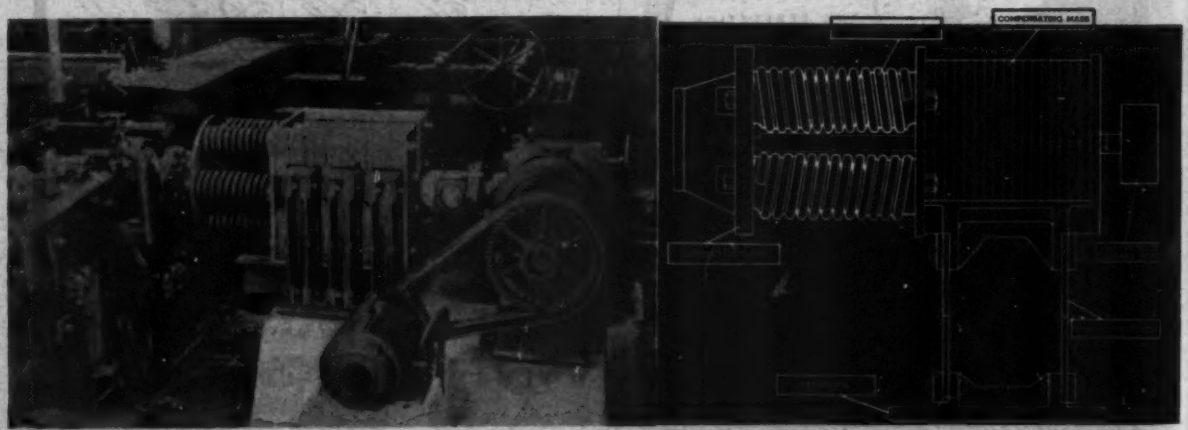
The drive operates from either a-c or d-c incoming power. If used with a-c, the drive consists of a generator, a cross-flux exciter, an ordinary constant-voltage exciter—all driven by an induction motor, and a d-c. hoist motor. If used with d-c., a shunt-wound d-c motor drives the generator and cross-flux exciter instead of an induction motor, and the constant-voltage exciter may be eliminated. Regardless of the type of power used, it is the construction of the cross-flux exciter and the way in which it is connected to the other components of the drive that produces the unusual characteristics.

In operation, heavy loads are both hoisted and lowered at slow speeds, and

light loads or the empty hook are hoisted and lowered at high speeds. Intermediate loads are handled at intermediate speeds, depending on the weight of the load. These speed changes are inherent in the drive and do not depend on the functioning of the control devices. All braking is accomplished electrically, the power being returned to the supply system instead of being dissipated in resistors. A solenoid brake holds the load when at rest.

Germicide-Fungicide

A colorless, odorless, liquid germicide-fungicide, designated as *Ramplex*, has been announced by Rampel Chemical Company, 140 E. Third St., Mount Vernon, N. Y. The product is suggested by the manufacturer for slime control, for use in the manufacture of bacteriostatic-mildew resistant paper, as a preservative for paper coatings, and for treating paper mill felts. According to the manufacturer, Ramplex is effective in controlling slime in concentrations as low as two parts per million; that a small amount of Ramplex used in the finishing process produces a paper on which germs and fungi cannot grow; that Ramplex incorporated in paper coat-



Typical installation of the Compensator (at left) and diagrammatic sketch

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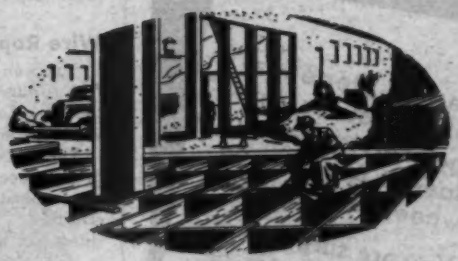

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ings as a preservative renders the paper upon which such coatings are used bacteriostatic and fungistatic; and that Ramplex-treated felts are longer wearing than untreated felts because of their increased resistance to the deteriorating action of micro-organisms. Ramplex also is stated to be non-irritating to the skin under recommended concentrations.

Wire Rope Safety Splice

American Chain & Cable Company, Inc., Bridgeport, Conn., has announced the *Acco-Loc Safety Splice* for splicing wire rope into slings or various assemblies.

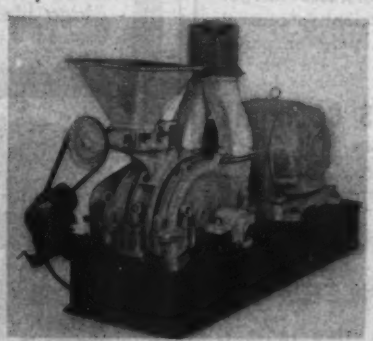
The splice, which develops 100 per cent of the rope strength, is flexible clear to the terminal. It does not distort the rope structure. It applied the load stress in direct line with the pull of the load.

The splice has no seizings to loosen, unravel or get in the way; no wire ends to barb and tear workmen's hands. It is wide open for visual inspection at all times. It may be used with any standard fitting (hook, ring, shackle, thimble, etc.), and when the sling or assembly is retired, such fittings may be salvaged and re-used.

At the present time, the splice can be applied only at the factory.

Screenless Pulverizer

A screenless pulverizer, the *Mikro-Atomizer*, has been announced by Pulverizing Machinery Company, Chatham Road, Summit, N. J., for the production of powders of particle sizes ranging from one to 25 microns.



Raw material is fed into the mill from the customary hopper. After its initial breaking down by rotating hammers, an air stream carries the dispersed particles into a separator wheel, where they are whirled about at a speed of from 4000 to 7000 rpm.

Suction created by a fan, located adjacent to the separator wheel, draws out the finest particles and discharges them. The centrifugal force imparted by the separator wheel, however, causes the coarser particles to resist the pull of the fan, and they drop back into the path of the hammers. In this way, the coarser particles are beaten and rebeaten until they are fine enough to yield to the pull of the fan.

This pull, or aerodynamic drag, in opposition to centrifugal force, is the unique principle in the design of the device.

Screw-Type Electrode Holder

A screw-type electrode holder of simplified design has been announced by Allis-Chalmers Mfg. Co., Milwaukee, Wis.

The simplified design facilitates easy replacement of parts. Heavy insulation and adequate handle ventilation provide cool operation.

Exposed metal surfaces of the holder are constructed of spatter-resistant Mallory metal.

The new holder is available in light and heavy duty sizes to accommodate electrodes up to ⅜ in. diameter.

Shop Desk

Lyon Metal Products, Inc., 161 Clark St., Aurora, Ill., has announced a portable desk for various industrial uses. This desk is designated as portable model No. 2131-15. Standard on 3 in. swivel casters and having a positive brake attachment,

the desk has a smooth 30 in. top with a 3 in. overall slope and a 24 in. by 28 in. by 3 in. drawer equipped with lock. The overall size of the unit is 34½ in. wide, 30 in. deep, and 53 in. high (43 in. high in front).

Chemical for Slime and Lime Scale Control

A chemical that inhibits slime growth and controls formation of lime scale deposits in evaporative condensers and evaporative coolers has been announced by Oakite Products, Inc., 16 Thames Street, New York 6. This material, known as *Oakite Airefiner No. 52*, is a white powder, completely soluble, odorless and non-toxic. One ounce added to 10 gallons of make-up water in sump is said to keep water sweet, prevent slime and hard lime scale from forming on coils, keep equipment clean and minimize need for maintenance.

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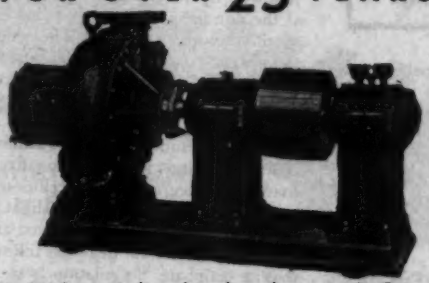

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TECHNICAL DEVELOPMENTS

These abstracts are of the latest developments found in the American and foreign press.

The Polyamide Resins

The resins are formed by the interaction of ethylenediamine with dimerized and trimerized linoleic and linolenic acids obtained from soybean oil. The resins were first developed as Norelac by the Northern Regional Research Laboratory. They are resistant to weak acids and alkalies, oils, greases, hydrocarbons, and to aqueous solutions generally. They do not ignite readily. Although they are not tacky at room temperatures, they are excellent adhesives at temperatures just below the melting points, which are fairly elevated. Their toxicity is not high. The resins have been used in hot melt coating and in heat seal applications. They can be used in heat-sealing waxed papers. They heat seal at temperatures lower than those usually used and do not block at room temperatures.

Temperatures above 135 deg. C. are not recommended. If the resins become too hot they melt to an oily film which has no adhesive properties until it drops to 100 deg. Moisture vapor data for glassine paper coated on either side with hot melt (ED-93) polyamide resin gave better TAPPI standard flat and creased permeability data than did paraffin wax-coated glassine paper. The resins are compatible with nitrocellulose lacquer and may be used as wood sealers where they reduce brittleness of the compounds present. These polyamide resins are available in four types in ton lots. A. G. Hovey. Modern Plastics 22, No. 9, 125-6, 192 (1945); through B.I.P.C. 15, 376 (1945).

Critique of the Alpha-Cellulose Determination

This is a monograph that gives every extensive experimental data, and which is divided into 8 main parts.

(1) A general discussion of the micellar and morphological structure of the cellulose fibre;

(2) the action of sodium hydroxide on cellulose;

(3) the state of cellulose in solution;

(4) the determination of alpha-cellulose;

(5) the precipitation of beta-cellulose;

(6) the dependence of the non-precipitable cellulose content of an alkaline solution on the technique used in obtaining the alkaline solution;

(7) the relationship of various cellulose fractions obtained on treating pulps with alkali;

(8) General conclusions and 206 literature references.

The first three sections are in the main critical surveys of the literature. Section 4 gives an evaluation of the methods used in the alpha cellulose determination with special reference to the amounts of caustic soda used, the wet combustion of various cellulose fractions, and an experimental study of the influence of certain variables on the alpha-cellulose determination. These variables include: fineness of division of the sample, presence or absence of air during the alkaline treatment, ratio of alkali to cellulose, temperature, and time. Experiments were carried out both with standard cellulose and with various pulp samples.

In the determinations 0.3-0.5 gram of pulp (free from resins and from fats) was treated with 15-25 ml. of 17.5% sodium hydroxide and (in the case of beta and gamma cellulose determinations) the excess of alkaline solution was removed either by suction or by centrifuging, care being taken to prevent the loss of water. For a determination of combined beta- and gamma-cellulose a 5 ml. aliquot portion was oxidized with acid bichromate. From another 5 ml. portion, the beta-cellulose was precipitated with 15 ml. of sulphuric acid (d. 1.054) allowing the mixture to stand for 24 hours prior to centrifuging. Gamma-cellulose was determined in 15 ml. of this centrifugate by wet combustion. Prior to the wet combustion, in the case of alpha-cellulose, washing of the residue from the alkaline treatment was kept at a minimum. In all the wet combustions with potassium dichromate, the excess of dichromate was determined by electrometric titration with a standard ferrous salt for which details are given. Air contained in caustic soda solutions has only a negligible effect on the alpha-, beta-, and gamma-cellulose determinations.

In the alpha-cellulose determination of an air-dried pulp, the ratio of 17.5% NaOH to the sample could be varied over a fairly wide range without markedly influencing either this determination or that of beta or gamma-cellulose. Small temperature fluctuations were practically without effect. Up to a four-hour treatment with alkali (under nitrogen or air) showed no appreciable differences in the results obtained respectively for the three cellulose components of a pulp. Even after 24 hours, the decrease in total alpha was relatively slight. The beta-cellulose values in a pulp are little influenced by changes in the amount of acid used in the precipitation of this fraction, nor by the temperature.

When a pulp was treated with alkaline solutions of concentration below 8%, the gamma-cellulose content rose with increasing alkali concentrations. However, the gamma-cellulose values remained roughly constant at concentrations between 8 and 20% NaOH, despite the fact that the combined beta- plus gamma-cellulose reached a sharp maximum at 10% NaOH. The use of sodium zincate as a solvent for cellulose (Cf Davidson, J. Textile Institute, 28, No. 2, T27-44 (1937)) is discussed at length.

The present author describes a new quantitative series of experiments in which 3.25 molar sodium zincate is the reagent, and in which the cellulose is flocked out of the resulting solution by means of sodium sulphate. This method of partial solution, followed by precipitation, gave a measure of the non-precipitable part of the cellulose in this zincate solution. The amount of this fraction (under fully described conditions) is quite reproducible. Except for dilute cellulose solutions (e.g. 0.4%) the sodium sulphate flocculation at 30 degrees is practically independent of cellulose concentration, and is largely unaffected by time. The degradation of cellulose chains during flocculation is very slight. This sodium zincate solution employed at minus 5, zero, and at 20 deg. C. followed by sodium sulphate flocculation was applied to six commercial sulphite pulps and to one sulphate pulp. Whereas the portion of pulp that dissolved increased with decreasing temperature, the % of dissolved material that could not be recovered on flocculation remained practically constant for a specific pulp, irrespective of the temperature of the initial treatment. This soluble (nonprecipitable fraction) was highest in the sulphate pulp.

Analogous experiments with these same pulps, but using 2.77 molar NaOH as the solubilizing agent, showed far lower solubility of the pulp sample; but, at minus 5 deg., the non-precipitable part was nearly the same as that obtained by using the zincate reagent. The relationship between soluble and non-precipitable parts of a pulp serve to characterize a specific pulp sample. This was shown by means of graphs. The author devotes a good deal of space to theoretical discussions. He also describes the various influences on swelling and fractionation of the pulps of the micellar and lamellar structure of the fiber. Thirty-three tables and 4 graphs are given. Hilding Tyden. Ing. Vetenskaps Akad. Handl. No. 175, 1-83 (1943) (German).

Melamine Resin

Recent developments have permitted the impregnation of printed or pigmented paper with melamine resins and then laminating and molding them, at low pressures. The melamine resin is used in the form of a thin varnish suitable for impregnation. The untreated stock is passed through a bath of the varnish and through squeeze rolls, and the impregnated material is then passed through a drying oven which evaporates the solvent and causes a partial polymerization of the resin. The treated material is rerolled for future use. Both fabric and paper treated by this procedure, when pressed and molded, possess the characteristic surface properties of high-pressure melamine resin. They are resistant to alkaline attack and to abrasion. They are stable. Their moisture absorption is low, and they are generally inert. The products are widely used in inlay decorative panels; often in children's furniture. Other suggested uses are: Table tops, game boards, radio panels, luggage cases, etc. Some of these are now in the experimental stage. Anon. Modern Plastics 22, No. 5, 105-7, 182, 184 (1945).

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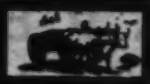

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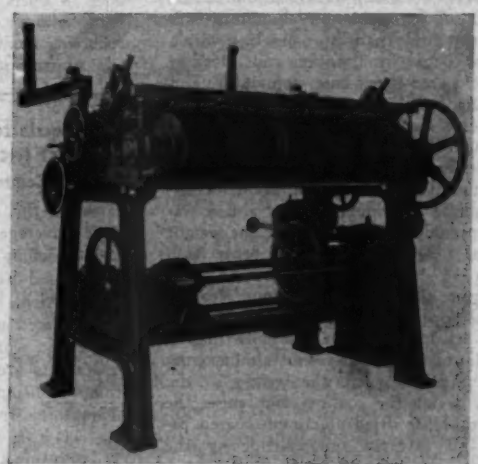

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PAPERMAKING PATENTS

IN THE UNITED STATES—Compiled by James Atkins, Registered Patent Attorney

Inquiries should be addressed to James Atkins, Munsey Building, Washington 4, D. C.

Fourdrinier Wire Change

Patent No. 2,360,773. Francis A. Helin, Watertown, N. Y., assignor to The Bagley and Sewall Company, Watertown, N. Y., a corporation of New York. Application July 7, 1942, Serial No. 450,021. 3 Claims. (Cl. 92—44).

1. In a Fourdrinier machine, the combination with the Fourdrinier frame, including supports and its wire, of means for moving the frame longitudinally for providing slack in the wire and means actuated by the longitudinal movement of the frame for tilting the frame to raise one side of the frame from its supports for providing clearance for the wire to move over the frame for wire change.

Process of Making Aluminum Coated Paper

Patent No. 2,362,884. John W. Clark, Westbrook, Maine, assignor to S. D. Warren Company, Boston, Mass., a corporation of Massachusetts. No Drawing. Application April 9, 1941, Serial No. 387,778. 1 Claim. (Cl. 117—71).

Process of making an aluminum coated paper product simulating aluminum foil, which comprises coating a paper base with a mineral coating composition and calendering the coated paper base, applying to and spreading over the mineral coated and calendered paper base a layer of aqueous aluminum powder-containing coating composition containing substantially greaseless aluminum powder, a wetting agent for dispersing the aluminum powder and a water-dispersible protein adhesive, the weight ratio of adhesive to aluminum being from 15 to 35 parts adhesive to 100 parts aluminum, the layer of aluminum coating composition being of a thickness to add, when dried, from 1 to not more than 5 pounds of the adhesive-aluminum composition per ream to the weight of the paper, drying the coating, moistening the surface of the dried aluminum coated paper, and severely supercalendering the latter.

Method of Preparing Paper Coating Composition and the Like

Patent No. 2,365,097. Harold R. Murdock, Asheville, N. C., assignor to The Champion Paper and Fibre Company, Hamilton, Ohio, a corporation of Ohio. No Drawing. Application August 13, 1941, Serial No. 406,731. 7 Claims. (Cl. 106—214).

1. In a process of preparing paper coating compositions comprising an aqueous suspension of mineral pigment and an adhesive derived from rice, the steps which include subjecting dehulled broken rice resulting from the production of polished rice and containing a high percentage of weed seeds to a mechanical disintegrating action in the presence of water until the rice particles are reduced to the state of a powder without the dark fibrous parts of the weed seeds being substantially disintegrated, and separating said dark fibrous parts of the weed seeds from the powdered rice.

Screen

Patent No. 2,358,970. Newenham A. Gray, Wausau, Wis., assignor to D. J. Murray Manufacturing Co., Wausau, Wis., a corporation of Wisconsin. Application August 10, 1942. Serial No. 454,239. 5 Claims. (Cl. 209—273).

1. In combination, an approximately rectangular casing having pulp feed and discharge launders at its opposite ends and a series of partitions between said launders dividing the intervening space into transverse gradually enlarging similar lower chambers having their deeper ends disposed in series along one side of the casing and their shallower ends disposed in like series along the other side of the casing, said casing also having an elongated duct in open communication with all of said shallower chamber ends and a liquid collecting launder extending along its side adjacent to said duct, a series of independent screen plates disposed in approximately the same plane above said lower chambers and coacting with said casing to provide a continuous upper chamber between said feed and discharge launders, a pulsator communicable with the deeper ends of all of said lower chambers and being operable to produce liquid pulsations therein, adjustable gates for varying the flow of pulsating liquid with respect to said lower chambers, and independently adjustable weirs interposed at the shallower ends of said chambers between said duct and said liquid collecting launder.

Apparatus for Refining Paper Stock

Patent No. 2,357,316. Edwin Cowles, Cayuga, N. Y., assignor to The Cowles Company, Princeton, N. J., a corporation of New Jersey. Application May 9, 1941, Serial No. 392,611. 8 Claims. (Cl. 92—23).

1. Apparatus for refining paper stock, comprising, in combination, a casing, a flat, annular screen in said casing, said casing having inlet and outlet openings on opposite sides of said screen, said casing having an impeller chamber, an impeller mounted for rotation in said chamber, said impeller being in the form of a disk extending outwardly from the hub of said impeller to the outer periphery of said screen and separating said chamber from said screen but being spaced from said screen to provide a screening chamber, and said impeller disk being provided with a passage near the hub through which stock may flow from said impeller chamber to said screening chamber.

Prerequisites for Indirect Incentives

(Continued from page 956)

cause of this situation, those considering wide coverage with incentives have the task of selling a plan of this order as the only sound basis for incentives on operations which, by their nature, cannot be standardized as to sequence, work content or even working conditions. Indirect operations are subject to more variables than non-standardized direct operations. Therefore, stronger reasons exist for the use of a so-called gain-sharing plan to keep the premium earned within an attractive range, and at the same time prevent erratic and high premiums from becoming extremely disturbing to the whole organization.

Much is said today about the necessity of a plan being so simple that all workers can understand and figure their own extra earnings. Where this condition of extremely low confidence between management and labor exists, it is doubtful that incentives of any sort can successfully be made. Desirable as it is to keep the plan simple and direct, it is also true that complex situations cannot be covered in a crude simple manner without such gross inaccuracy that the answers are disbelieved by both labor and management. During the past ten years many of the incentive plans abandoned were of this type. In order to cover the diverse problems of indirect operations, resort must be had to all known practices of recording time and production. Grouping is commonly the only practical basis of application, and the groups are usually fluid according to conditions. The time period may be the job, the day or the day period, according to the unit of production necessary to measure the performance. With this as a prerequisite to a rational measure, it is obvious that premium earnings may not be a simple calculation, and confidence must exist or be developed as the plan progresses.

Perhaps the most important single prerequisite for indirect incentives is a suitable management—labor relationship and policy on production problems. No better premise can exist than the simple statement "a fair day's work for a fair day's pay," and its corrollary "extra pay in proportion to effort beyond a fair day's work." It is essential that the scope of incentives be clearly defined in writing so that base wage problems will always be treated as such, and incentive earnings will always be considered as an extra, earned by the special efforts of the workers. Of prime importance is the understanding that the incentive pay is intended to be an attractive supplement to earning power but that the base wage alone covers "a fair day's work." In other words, a "run away" plan should be neither contemplated nor tolerated.

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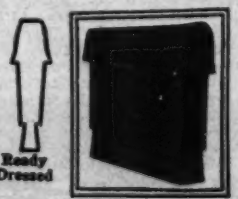

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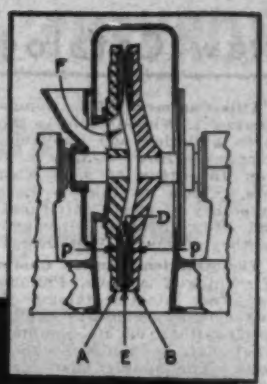

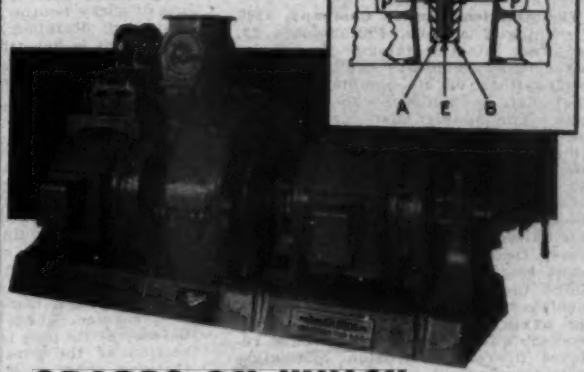

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New Catalogues and Publications

Allis-Chalmers Mfg. Company, Milwaukee 1, Wis.—Of timely interest are three bulletins just published by this company—"How to take a Reconversion Inventory of your Electric Motors," "How to take a Reconversion Inventory of your Centrifugal Pumps," and "How to take a Reconversion Inventory of your V-Belt Drives."

The American Pulley Company, 4200 Wissahickon Avenue, Philadelphia 29, Pa.—The latest catalogue issued by this company contains price lists and specifications on its complete line of fractional horsepower sheaves and belts. The booklet also contains four pages of condensed and simplified drive tables for a wide range of center distances and drive rations. Address Dept. 647 when writing for a copy.

Cochrane Corporation, 17th & Allegheny Ave., Philadelphia 32, Pa. Available on request is Reprint No. 43, "Cold Water Deaeration," taken from Power Plant Engineering, May, 1945. It explains the operation of the deaerator developed by this company for removing oxygen and carbon dioxide from process waters used cold. This removal prevents corrosion and gives protection to equipment.

Continental Asbestos & Refining Corporation, 1 Madison Ave., New York 10, N. Y. A new bulletin on their Stonoleum self-bonding, self-"healing" flooring has been issued by this company. Write directly to above address for copies.

Eastern Stainless Steel Corporation, Baltimore 3, Maryland—Now ready for distribution by this company is a complete 96-page handbook, "Eastern Stainless Steel Sheets." Almost a third of the catalogue is taken up with a pictorial review of the importance of stainless steel in various industries. Typical installations for paper manufacturing are shown on page 33. An informative section, entitled "Why Stainless Steel Resists Corrosion," is followed by technical data on gauges, sizes, tolerances and finishes. Also included is a complete section on processing and fabricating. An interesting and valuable feature is the four-page "turn-out" speed spread giving complete details on properties of Eastern stainless steels.

General Detroit Corporation, 2270 East Jefferson Avenue, Detroit 7, Mich. —A new 32-page, pocket size illustrated booklet, "How to Put Out a Motor Vehicle Fire," has been issued by this company for the use of operators of cars, trucks and buses. It contains simple instructions on what to do when a fire breaks out, as well as simple rules to follow in the prevention of motor vehicle fires. Complete I. C. C. safety regulations are also included. While the booklet is sent free of charge to fleet operating officials, requests are limited to one copy per person.

W. & L. E. Gurley, Troy, N. Y.—A condensed catalogue, Bulletin No. 50, describing its engineering instruments, has just been issued by this company. The booklet is well illustrated and has complete specifications of the various instruments. An interesting forepiece is the chronology of W. & L. Gurley's first hundred years, 1845-1945.

Ideal Commutator Dresser Company, Sycamore, Ill.—Of great interest to manufacturers in every field is a new booklet, "Modern Motor-Generator Maintenance and Repair Equipment for Reconditioning War Weary Machinery." Three pages are devoted to hints on commutator care—troubles and remedies.

Mellon Institute of Industrial Research, University of Pittsburgh, Pa.—Now available free of charge from the Mellon Institute are two reprints—"War Research at Mellon Institute, 1944-45," and "National Examination of Stream Pollution Abatement," by Richard D. Hoak. The first is reprinted from *Science* for May 18, 1945, and the second from *Science* for May 25, 1945.

Metallizing Engineering Company, Long Island City 1, N. Y.—A complete line of spray booths and dust collecting equipment designed for handling metal spray dust is described in Bulletin No. 43a, which is available on request.

Naylor Pipe Company, 1230 East 92nd Street, Chicago 19, Ill.—From its unusual cover to the last page of blueprints and photos, Catalogue No. 44, gotten out by this company, will be of great interest to all users of lightweight pipe. Paper mill applications are listed and illustrated. Among the applications claimed for paper mills are: Stock and pulp lines, ventilating, white water lines, condensate, hot and cold water lines, compressed air, pneumatic conveying, and exhaust steam. The company's made-to-order fabrication service which enhances the efficiency of its pipe is the subject of one section of the catalogue. Other illustrations show uses for Naylor pipe data, analysis charts and specification tables make this booklet very helpful.

The Wm. Powell Company, 2503-31 Spring Grove Avenue, Cincinnati 22, Ohio—Just issued by this company is a booklet, "The Powell Quiz Kit," a reprint of "Quiz Kit" ads which have been appearing since November, 1943. The bulletin contains interesting and instructive information on valves—their selection, design, construction, application and care. Copies will be sent to all persons interested in and working with flow control equipment.

Rodgers Hydraulic, Inc., St. Louis Park, Minneapolis 16, Minn.—A catalogue containing illustrations of various applications of its universal hydraulic press has been gotten out by this company presents some helpful incontains specifications of the press.

J. O. Ross Engineering Corporation, 350 Madison Avenue, New York 17, N. Y.—In their new Catalogue No. 131, this company present some helpful information on principles and processes of industrial drying, and describes methods employed in a variety of industries, including pulp and paper. The booklet also treats such subjects as infra red drying; sources of heat and heat cost; comparisons; material handling; oven construction and temperature control. Copies of this bulletin may be obtained from the above address, or from branch offices in Boston, Chicago, Detroit and Los Angeles.

Tennessee Eastman Corporation, Kingsport, Tenn.—Just issued by this company is a two-page bulletin, entitled, "Tenite Cementing and Assembling," which describes the procedure to be followed in cementing together pieces of molded Tenite, Eastman cellulose ester plastics. Two types of cementing agent are discussed — the first, solvent type, where surfaces on a single plane are to be cemented; the second, dopes, to be used where surfaces are irregular and at not easily accessible positions. For cementing Tenite to other materials, such as glass and metal, the bulletin lists recommended materials, and the sources where they may be obtained.

Union Iron Works, Erie, Pa. — A booklet describing their evaporators; heat exchangers; condensers; autoclaves; reaction vessels; extraction columns; rectifying, fractionating and distillation towers; crystallizers; gas dryers and cleaners is now available. Address the Process Industries Department of this company.

Books

Barrel's Paper Annual — The 1945-46 edition of this work has been issued by William L. Barrell Company, Lawrence, Massachusetts. In general, the style of this publication is similar to previous editions. In addition to containing a directory of officials of paper industry associations, the annual includes the following articles: The Paper Industry in 1944, by E. W. Tinker, executive secretary, The American Paper and Pulp Association; Paper Products Face the Future, by R. G. Macdonald, secretary-treasurer, Technical Association of the Pulp and Paper Industry; The Institute of Paper Chemistry, by Clarence J. West, research associate and editor, The Institute of Paper Chemistry; TAPPI'S Contribution to the Pulp and Paper Industry, by Vance P. Edwardes, president, Technical Association of the Pulp and Paper Industry; and Salesmen's Association Looks Ahead, by Burt R. Fisher, president, 1944, Salesmen's Association of the Paper Industry.

The cover of the annual is stiff and durable. It is of tan-colored cloth. Backbone binding is of ivory-colored plastic. Cover printing is black.

Packaging Catalog — The 1945 issue of this encyclopedia of packaging has been prepared with a definite perspective of reconversion and the potential problems that will attend peacetime production. The magnitude of the subject, and the conditions faced by the compilers in putting out such an extensive work at this time have not been reflected in the 1945 book. The Packaging Catalog is truly a complete treatise on every phase of packaging from raw materials through all channels of conversion, shipping, and merchandising. Packaging machinery is covered in chapters which form a book within a book. This section starts with the principles of mechanization and plant layout. Each operation is thereafter given special mention.

Throughout its 957 pages, the book itself is a fine piece of work. The sections are organized with index tabs for ready reference. There is an extensive index of subjects, and a buyers' guide. Throughout the book the text is amplified with fine illustrations. If information on packaging is needed, it will be found in this work. Available from the publishers, Packaging Catalog Corporation, 122 East 42nd Street, New York 17, N. Y.

Resins — Rubbers — Plastics (Patent Digest Service) — Designed to supplement the Literature Service of the same publishers on Resins, Rubbers, and Plastics and to create a complete patent file on the subject, this first issue of a loose-leaf abstract service totaled 96 pages. Twelve issues, totaling approximately 1800 pages, are planned for the first year—1945.

The first issue contains a table of contents or substance designations as well as an explanation as to organization of material and filing procedure. It also contains abstracts on steam set printing inks, dehydroabietic acids, hydrogenated rosin acids, high melting asphalts, mastication of rubber, bonding of rubber to metal, modifiers for emulsion polymerization, stabilization of acetal resins, copolymerization of acrylonitrile, furfural plastic from farm waste, etc.

H. Mark is Scientific Editor; E. S. Proskauer, Managing Editor; Interscience Publishers, Inc., 215 Fourth Avenue, New York 3, New York, the publisher.

The subscription price of the Service is $45.00 a year (Binder $3.50).

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FLEXO JOINTS are used everywhere in industry to convey steam, compressed air, gas, hot or cold water, oil and other fluids through pipe lines that must be moved or swung in different directions or to supply machinery or equipment with any fluid while in motion.

They are ruggedly constructed for long, hard service and will outlast the pipe or machine to which attached. FLEXO JOINTS swivel easily through 360°, yet they maintain the alignment of the piping in which installed. Any desired pipe line flexibility can be obtained by using a combination of the 4 styles. The initial cost is nominal; the maintenance cost is negligible. Try them; know how inexpensive and efficient they are.

Standard iron pipe sizes from ¼ inch to 3 inches—all pressures to 1350 lbs. superheated steam.

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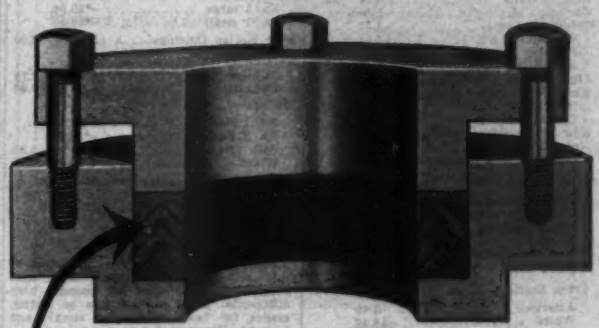

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Garlock Chevron is not just an ordinary "V" type packing. It has an exclusive hinge-like construction which permits automatic expansion and contraction. The packing expands as the pressure increases and contracts as the pressure decreases. Friction on the rod and on the packing itself is thereby reduced to a minimum. Long, dependable service results—frequent shut-downs for re-packing are avoided—production increases—operating costs are reduced. You'll like CHEVRON!

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In Canada: The Garlock Packing Co. of Canada, Ltd., Montreal, Que.

Garlock 430 CHEVRON for hydraulic service.
Garlock 431 CHEVRON for oils at low temperatures.
Garlock 530 CHEVRON for steam, air or gas.
Garlock 531 CHEVRON for hot oils.

Garlock

CURRENT MARKET QUOTATIONS

RAGS (Domestic)

NEW RAGS

OPA ceiling prices in sales to consuming mills delivered buyer's usual receiving point, with brokers' allowance not in excess of 5 per cent.

	per cwt.
Blue Overalls	-6.50
Corduroy, Men's	-8.50
Corduroy, Ladies'	-3.00
Washables, No. 1	-3.00
Percales	-4.75
New Soft Blacks	-3.75
Light Prints, No. 1	-4.50
Khaki Cuttings—	
Bleachable	-4.25
Unbleachable	-3.50
New White Canvas	-6.00
New Mixed Blacks	-3.25
Canton Flannels, Bleached	-7.00
Shirt Cuttings—	
New White No. 1	-7.25
No. 1 White Heedings	-7.25
White Shrunk	-6.00
Silesias No. 1	-5.75
New Unbleached	-7.50
Fancy	-3.50
Linen Cuttings—	
American	-8.00
White	-14.00
Grey	-16.00

RAGS (Domestic)

f. o. b. New York City

OLD RAGS

OPA ceiling prices in sales to consuming mills f. o. b. cars at points of shipment, with brokers' allowance of $1 to $2 a ton depending on the value of the grade involved.

	per ton
Bonding—	
No. 1	31.00
No. 2	30.00
No. 3 and No. 4	27.00
Twos and Blues—	
Repacked	44.00
Thirds and Blues—	
Repacked	44.00
Miscellaneous	36.00
Whites, No. 1—	
Repacked	76.00
Miscellaneous	64.00
Whites, No. 2—	
Repacked	56.00
Miscellaneous	53.00

RAGS (Foreign)

ex dock New York City

NEW RAGS

	per cwt.
New Dark Cuttings	Nominal
New Mixed Cuttings	
New Light Silesias	
Light Flannelettes	
Unbleached Cuttings	
New White Cuttings	
New Light Oxfords	
New Light Prints	

RAGS (Foreign)

ex dock New York City

OLD RAGS

	per cwt.
No. 1 White Linens	Nominal
No. 2 White Linens	
No. 3 White Linens	
No. 4 White Linens	
No. 1 White Cottons	
No. 2 White Cottons	
No. 3 White Cottons	
No. 4 White Cottons	
Extra Light Prints	
Ord. Light Prints	
Med. Light Prints	
Dutch Blue Cottons	
French Blue Cottons	
French Blue Linens	
Checks and Blues	
Linsey Garments	
Dark Cottons	
Old Shoppers	

ROPE and BAGGING

f. o. b. and ex dock New York City

	per cwt.
Gunny No. 1—	
Foreign	Nominal
Domestic	2.10 to 2.25
Wool Tares—	
Light	3.75 to 4.00
Heavy	4.00 to 4.25
No. 1 Scrap Bagging	2.75 to 3.00
Manila Rope—	
No. 1 large	-*115.00
No. 1 small	-*105.00
Sisal Rope—	
No. 1 large	-*95.00
No. 1 small	-*80.00
New Burlap Cuttings	5.50 to 6.00
Jute Threads—	
Foreign (Nom.)	6.25 to 6.75
Domestic	5.50 to 6.00
Strings—	
No. 1 sisal	-*80.00
No. 2 sisal	-*60.00
Soft jute	5.00 to 5.50
Mixed	1.75 to 2.00

*OPA ceiling price per ton f. o. b. shipping point.

WASTE PAPER

OPA ceiling prices f. o. b. points of shipment for machine compressed bales weighing not less than 500 pounds (with differential of $5 per ton less on certain grades for loose or bundled stock), and brokers' allowance of 4 to 9 per cent.

	per ton
Shavings—	
White Env. Cuts, One-Cut	47.50-
Hard White Env. Cuts	62.50-
Hard White, No. 1	57.50-
Soft White, No. 1	50.00-
Soft White, One-Cut	57.50-
Soft White, Misc.	43.00-
Fly Leaf, No. 1	32.50-
Fly Leaf, Woody, No. 1	25.00-
No. 2 Mixed Col. Woody	18.00-
Flat Stock—	
No. 1 Heavy Books and Magazines	32.50-
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New Env. Cuttings	53.00-
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Kraft—	
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CHEMICALS

f. o b. shipping point

Alum (Papermakers)—	
Lump, cwt.	4.25-
Ground, cwt.	4.60-
Powdered, cwt.	4.40-
Blanc Fixe—	
Pulp, bulk, ton	40.00 to 42.50
Dry, barrels, pound	60.00 to —
Bleaching Powder—	
Drums, cwt.	2.05 to 2.10
Casein (Domestic Standard)—	
20-30 mesh (bags), lb.	24.00 to 24.75
80-100 mesh (bags), lb.	—
Argentine, lb.	21.00 to 24.00
China Clay—	
Domestic Filler	
Bulk (mine) ton	8.50 to 10.00
Domestic Coating	
Bulk (mine) ton	11.00 to 22.00
Imported (ship side)	
Bulk (lump) ton	14.00 to 20.00
Chlorine—	
Tank cars (wks) cwt.	2.00 to 2.25
Gelatine (illicin), lb.	.90 to .95
Glye. (C.P.) drums, lb.	17.25 to 17.75
Litharge, powd., bbl., lb.	.09 to —
Rosin (Gum)—	
New York, per 100 lbs.	
E	7.27—
F	7.37—
G	7.41—
WW	8.17—
Rosin (Wood), carlots	4.50—
Salt Cake—	
Dom. bulk (wks) ton	15.00 to 16.00
Imp. bulks on dock—	
(Atl. ports) ton (Nom.)	20.00 to —
Soda Ash—	
Bulk (works), cwt.	.90 to .95
Paper Bags, cwt.	1.05 to 1.25
Barrels, cwt.	1.05 to 1.25
Soda (Caustic)—	
Solid, drums, cwt.	2.30-
Ground and flake, drums, cwt.	2.70 to 2.95
Sodium Silicate—	
60 deg., 55 gal. drums, (works) cwt.	1.85 to 2.05
40 deg., 25 gal. drums, (works) cwt.	.80 to 1.45
Starch—	
Pearl, 140 lb. bags, cwt.	2.75-
Pearl, barrels, cwt.	2.85-
Paper (Sp.) bags, cwt.	2.85-
barrels, cwt.	2.95-
Sulphur (Crude)—	
(Mine) bulk, long ton	16.00 to—
Talc—	
Dom. 100 lb. bags (mine) ton	16.00 to 21.00
Imp. bulk, ton (Nom.)	—
Titanium Dioxide—	
Barium Pig., bbls., lb.	.05½ to .06
Calcium Pig., bbls., lb.	.05 to .05½
Zinc Sulphide, bbls., lb.	5.00 to 5.55

WOOD PULP

OPA maximum prices applicable to wood pulp delivered to consumer mills located East of the Continental Divide exclusive of Denver, Colo. (West of the Continental Divide and in Denver, Colo., ceilings are $6 per ton lower):

Bleached softwood sulphite	86.00
Unbleached softwood sulphite	74.00
Bleached hardwood sulphite	83.50
Unbleached hardwood sulphite	71.50
Northern bleached sulphate	86.00
Southern bleached sulphate	79.00
Northern semi-bleached sulphate	82.00
Southern semi-bleached sulphate	75.00
Northern unbleached sulphate	73.00
Southern unbleached sulphate	63.50
Bleached soda	76.00
Unbleached soda	72.00
Ground wood pulp	50.00
Ground wood—paper machine dried and mutilated	52.00
Sulphite screenings	49.50
Sulphate screenings	39.00
Ground wood screenings	32.00
Northern unbleached sulphate siderums	73.00
Southern unbleached sulphate siderums	63.50
Standard news print siderums	50.00

PAPER

f. o. b. New York City

	per ton
Boards—	
Binders	84.00-
Chip	50.00-
Chip, tube and can	52.00-
Chip, full-blending	54.50-
Chip, sgl. mls. lined	62.00-
Coated, white patent .014	82.00—
.018 and heavier	77.00—
Kraft liner	63.00-
News	50.00-

Book Papers—OPA base maximum prices per cwt. 4 cases or equivalent, f. o. b mill with quantity weight, manufacturing and other differentials allowed:

Uncoated (Untrimmed)

Book, White (M. F.)—	
A Grade R. F.	8.25
B Grade R. F.	7.90
C Grade R. F.	7.55
D Grade R. F.	7.20
E Grade R. F.	7.65
No. 2 Uncoated Offset 4 sides. White	9.45
Coated White (Trimmed 4 sides)	
No. 1 Glossy	11.90
No. 2 Glossy	10.85
No. 3 Glossy	10.15
No. 4 Glossy	9.80
No. 5 Glossy	9.30
C2S Offset	10.40
C1S Litho (Varnish)	10.00
C1S Litho (Non-Varnish)	9.80

Writing Papers—OPA base maximum prices per cwt. on writing papers, f. o. b. mill with zone, quantity, packing and other differentials allowed:

Rag Content Bond—	per cwt. 20 lb.	16 lb.
Extra 100% Rag	34.00	34.00
100% Rag	28.00	28.00
75% Rag	20.00	20.00
50% Rag	16.00	17.25
25% Rag	14.00	15.00

Rag Content Ledger—	per cwt. Zone 1
Extra 100% Rag	35.00
100% Rag	29.00
85% Rag	26.00
75% Rag	21.00
50% Rag	17.00
25% Rag	15.00

Sulphite Bond—	per cwt. 20 lb.	16 lb.
Air dry, watermarked	13.75	13.70
No. 1 (M. F.) watermarked	9.00	9.70
No. 2 (M. F.) watermarked	8.25	8.85
Plain (M. F.) unwatermarked	7.60	8.20

Sulphite Ledger—	per cwt. Zone 1
No. 1 (M. F.) watermarked	10.00
No. 2 (M. F.) watermarked	9.25
Plain (M. F.) unwatermarked	8.60

Glassine (f. o. b. mill)—	per cwt.
Embossed (25 lb. up)	13.75 to 14.25
Bleached (25 lb. up)	12.75 to 13.25
Unbleach. (25 lb. up)	11.50 to 12.00
Greaseproof—	
Bleach. (25 lb. up)	11.00 to 11.50
Unbleach. (25 lb. up)	10.00 to 10.50

News—OPA Ceilings—	per ton
Rolls, Standard (Contract)	61.00
Rolls, Lightweight (Cont.)	65.00
Rolls (Spot)	(Nominal)
Sheets	69.00

Tissues (Carlots)—	per ream
White, No. 1	1.12½ to 1.20
White No. 2	.90 to 1.00
Bleached Anti-Tarnish	1.15 to 1.20
Colored	—
Anti-Tarnish Kraft	.70-
Manila	.90 to .95
Napkins, semi-crepe (12¼ lb. to M shts.) per cs.	.60-
Napkins, full crepe and emb'sed (12¼ lb. to M shts.) per cs.	.60-
Toilet, Bleached (M shts.) per cs.	5.65-
Toilet, Unbleached (M shts.) per cs.	4.25-

Towels—	per case
Bleached	3.20 to 3.75
Unbleached	2.60 to 3.05

Wrappings (Kraft)—	per cwt.
Super-Standard	5.25 to 7.65
No. 1 Wrapping	5.00 to 7.40
Standard Wrapping	4.75 to 7.15
Standard Bag	4.37½

Wrappings (Sulphite and Bleached Kraft)—

(Rolls, f. o. b. mill)

Bleached Papers—	per cwt.
M.F. & M.G. Waxing, 30 lb. (Carlocds only)	7.25 to 7.50
(10,000 lbs.)	7.50 to 7.75
Drug wrapp. 35 lb.	7.00 to 7.25
Unbleached Papers—	
Com. Grd. Butch. 40 lb.	5.50 to 5.75
No. 1 Butchers	5.75 to 6.00
No. 1 Imit. Parch & Dry Fin. Groc. Sulphite 30 lb.	6.25 to 6.50
No. 2 Imit. Parch & Dry Fin. Groc. Sulphite 30 lb.	6.00 to 6.25
Steam Finish, 50 lb.	5.00 to 5.25
Water Finish, 40 lb.	5.50 to 5.75

Manilas—	
Envp. Mls., Sub. 16-40 (No. 1)	6.00 to 6.50
Envp. Mls., Sub. 16-28 (No. 2)	5.75 to 6.00
Envp. Mls. (Prices based on large sheets untrim'd roam-marked, in bdls.)	

Wrapp. Mls. 35 lb. up—	
No. 1	6.00 to 6.25
No. 2	5.75 to 6.00

M.G. Sulphite and Kraft (other than Waxing)	
Grade A-22 lb.	7.20 to 7.40
Grade B-20 lb.	6.75 to 7.00

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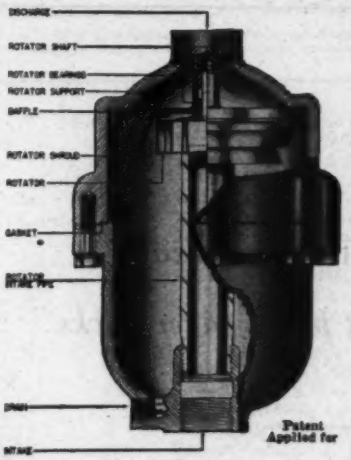
This new unit effectively eliminates moisture, oil and scale from compressed air lines. Pur-O-fier utilizes the principle of centrifugal force to separate entrainments from purified air. Once installed it requires absolutely no maintenance. Penstar Tru-Bond oiless bearing guarantees long, trouble-free operation. Manual or automatic drains provided.



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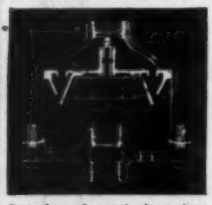

Drawing shows turbo-rotor, shroud and baffles. The design of the baffles precludes the possibility of capillary action of entrainments resulting from high velocity.

THREE MODELS AVAILABLE—A-1 will accommodate volumes from ½ to 5 cu. ft. A-2, volumes from 10 to 35 cu. ft. A-4, volumes from 35 to 100 cu. ft. Multiple units are recommended for volumes above this range. Pur-O-fier is the only standard unit that can be engineered to meet any air volume for regular or intermittent service.

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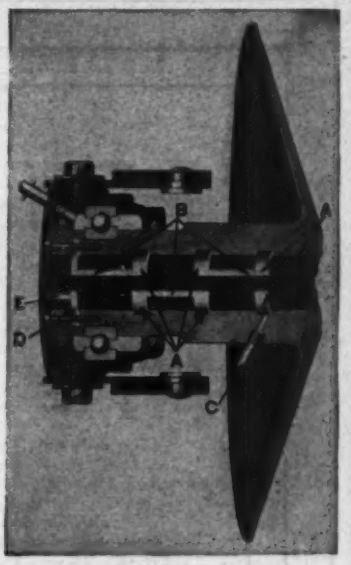

Disc Lubrication is simple, positive in a Lewellen *Variable-Speed* Transmission

● Note bore in disc hub sketched above. A series of annular grooves (A) are connected by channels (B) on alternate sides of the key. Grease enters at Alemite connection (C) and is forced through first groove, around shaft, to first channel which carries grease to the second annular groove. Again it passes around shaft to the next channel at opposite key side. This movement continues until grease has passed around all grooves, finally reaching space (D) where it passes around shaft and out at hole (E). Thus, an application of grease at (C) and fresh grease appearing at (E) means that all dirt and old grease has been cleared, for there are no dead ends or air pockets. Port (E) relieves grease channel of any built-up pressure from grease gun. Grease is not forced out between disc hub and shaft on disc face and belt.

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COLUMBUS, INDIANA

"Let us not pray for lighter burdens,

but for stronger backs."

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Parchment — Kalamazoo — Michigan

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Interested in making a connection where the compensation will be commensurate with the results produced through profit-sharing, bonus or opportunity to acquire equity stock.

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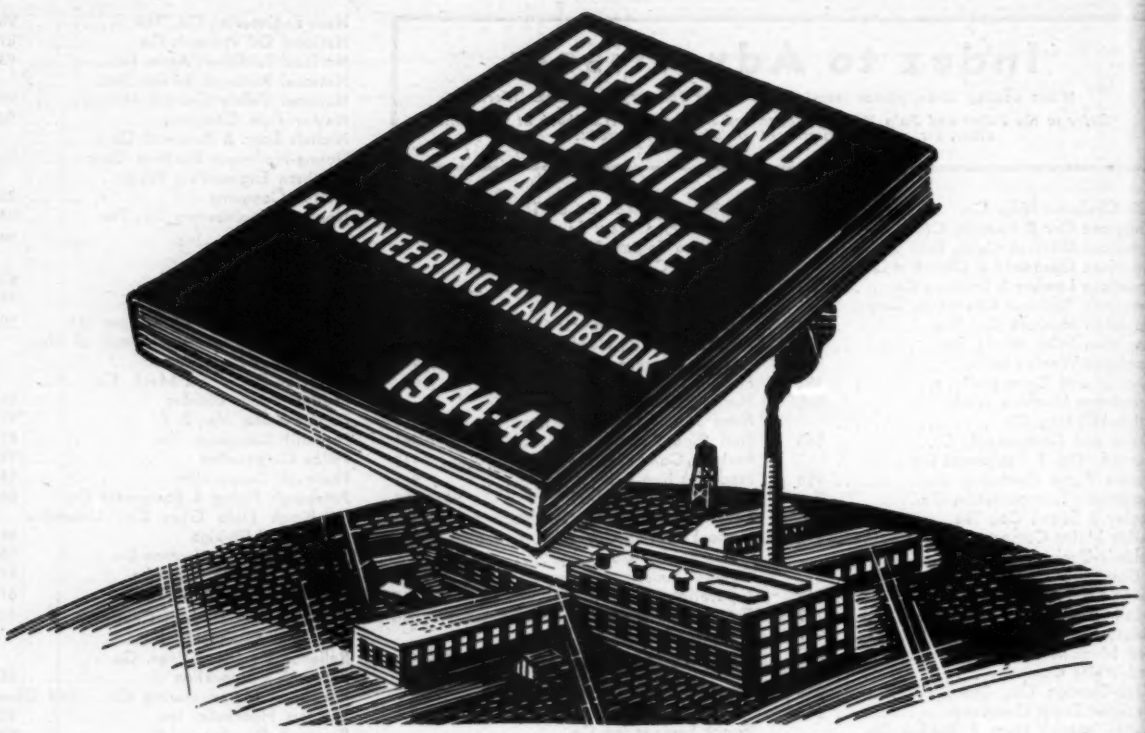

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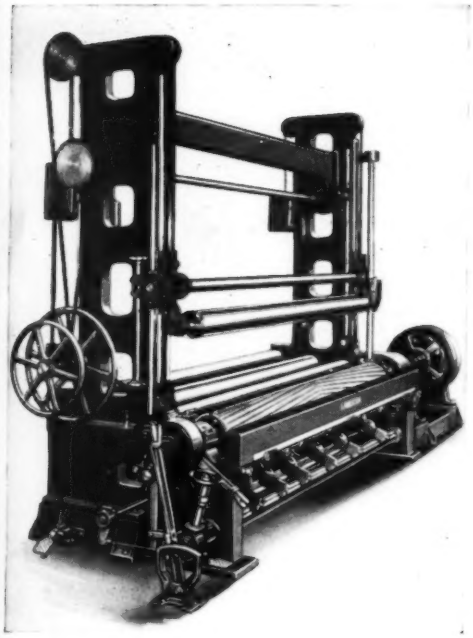

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